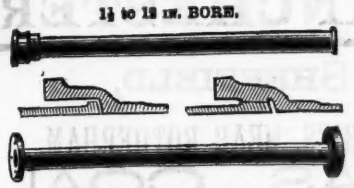
THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXIV. No. 1638.] LONDON, OCTOBER 2, 1894. [46TH YEAR. PRICE 6d.

GAS AND WATER PIPES

1¼ to 12 IN. BORE.



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Special Quotations to Gas Companies.

DARTMOUTH, DEVON.

Lanemark Coal Co.,

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LANEMARK CANNEL AND GAS COALS.

Quotations and Analysis on application to

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Shipping Ports: All the principal Scotch Ports.

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NEW HIGH-POWER GAS-LIGHT.

INCANDESCENT GAS-LIGHT SYSTEM.

Consumes 3¾ cubic feet per hour.

Gives a light of 70 to 80 candle power.

Brilliant Light.

Perfectly Steady and Noiseless.

Smokeless.

Reduced Heat.

The Ordinary Burner, with Special Globes, is suitable for Lighting Private Houses, Public Houses, Restaurants, Shops, &c.

Special Lamps constructed for Outside Lighting and Street Lighting; and Large Clusters of Lights made for Lighting Halls and large Areas from one centre.

Can be attached to any Gas-Fittings.

THE TRIUMPH OF GAS OVER ELECTRIC LIGHT.

Taking Gas at 3s. per 1000 cubic feet and Electric Light at 8d. per Board of Trade unit, the "C" Burner will produce an equal amount of light at **One-eighth the cost of Electric Light.** This cannot be disproved.

Substantial and Pushing Sole Agents wanted in each Town using Gas.

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Near St. James's Park Station.

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THE "POSITIVE" PREPAYMENT-SLOT-METER.

Noted for Strength and Simplicity of Construction.

Used by many Corporations and Gas Companies.

Material and Workmanship of the best.

Prices and full Particulars on application.

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JOHN BROWN & CO., LTD., SHEFFIELD,

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ALDWARKE MAIN CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

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Analysis: 12,600 feet of 19-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.
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FIRE BRICKS,
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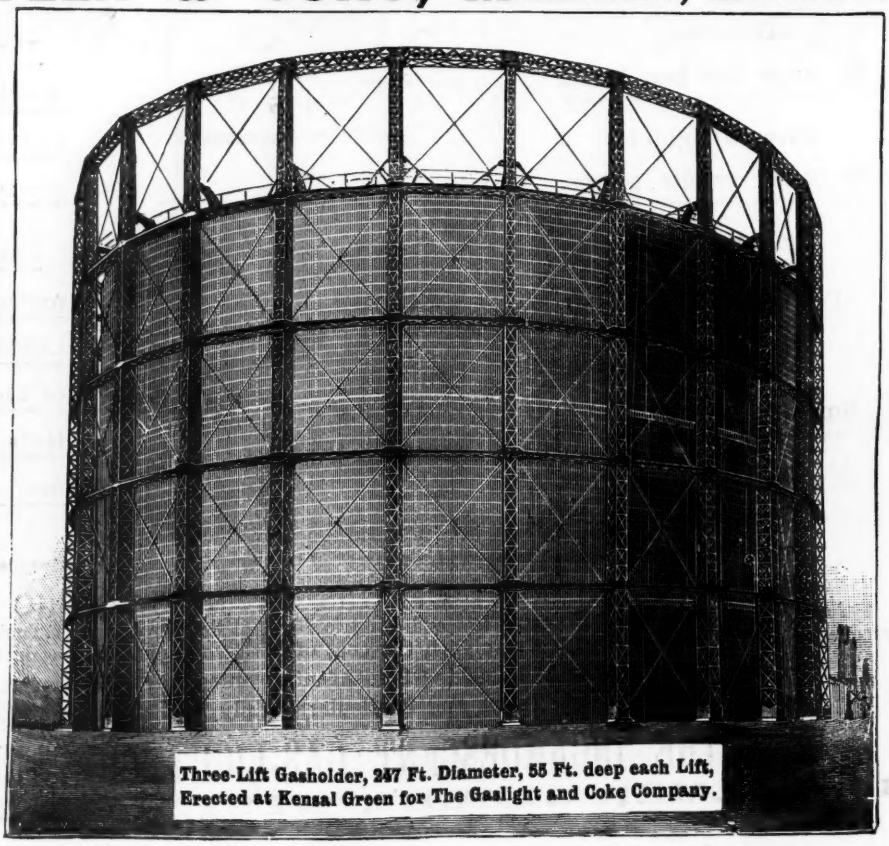

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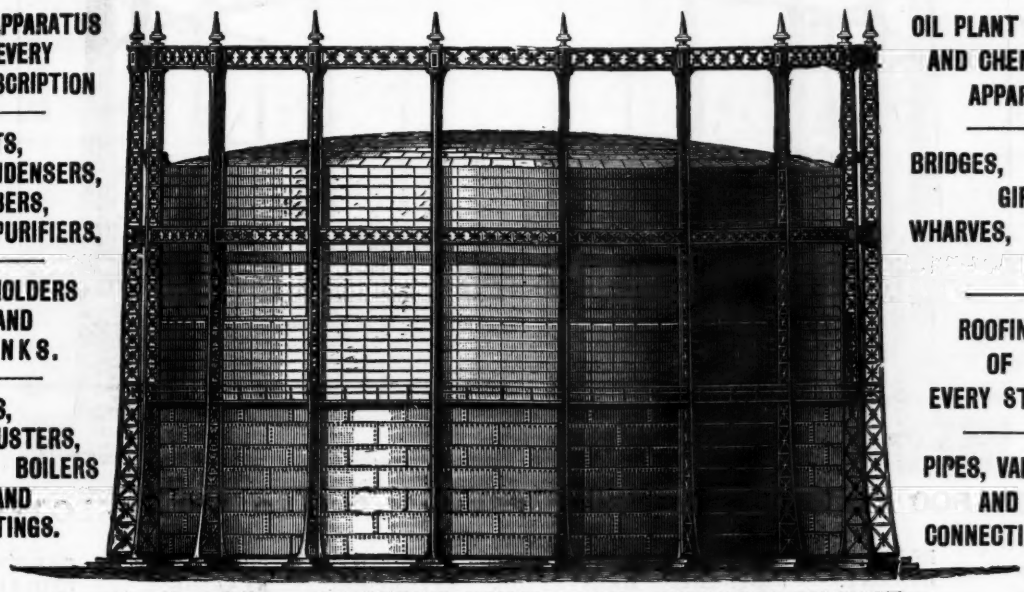

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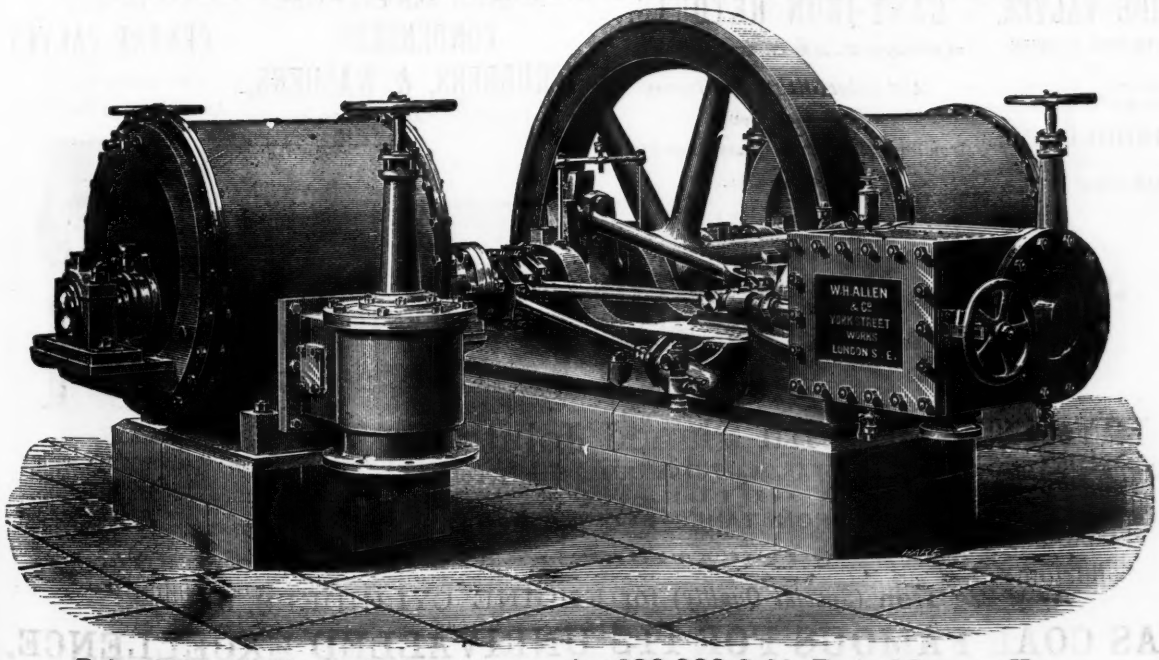

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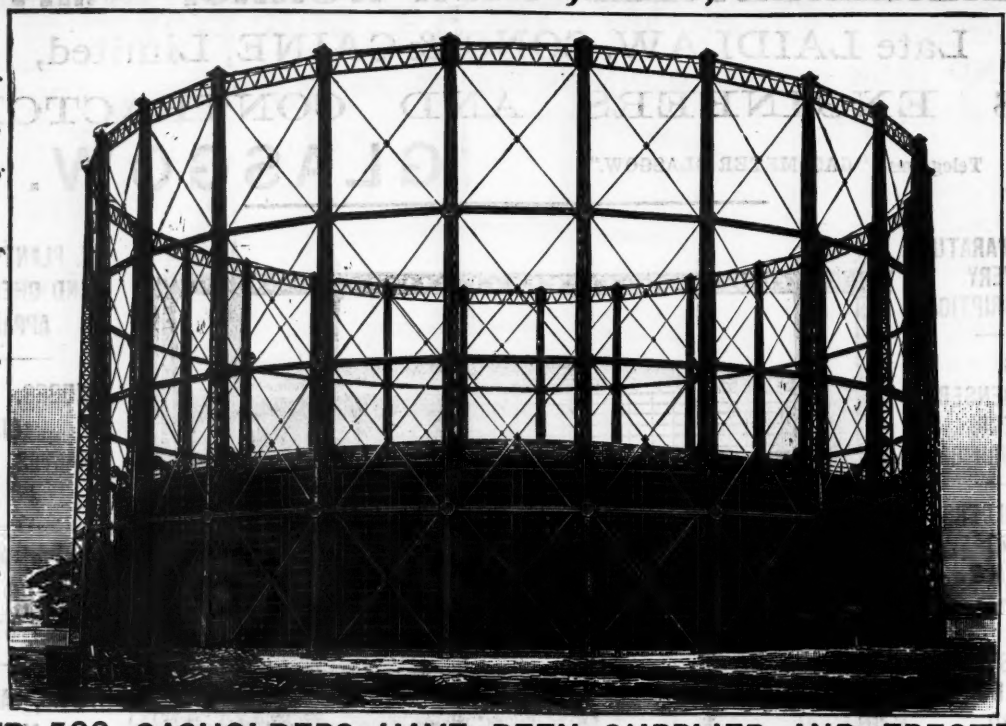

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SCREWS of all sizes.
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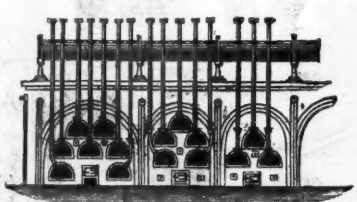
PATENT
CENTRE-VALVES
for working Purifiers,
Also Bye-Pass & Stop Valves.



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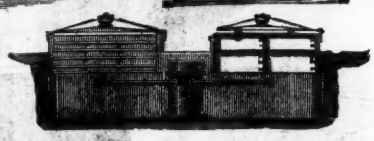

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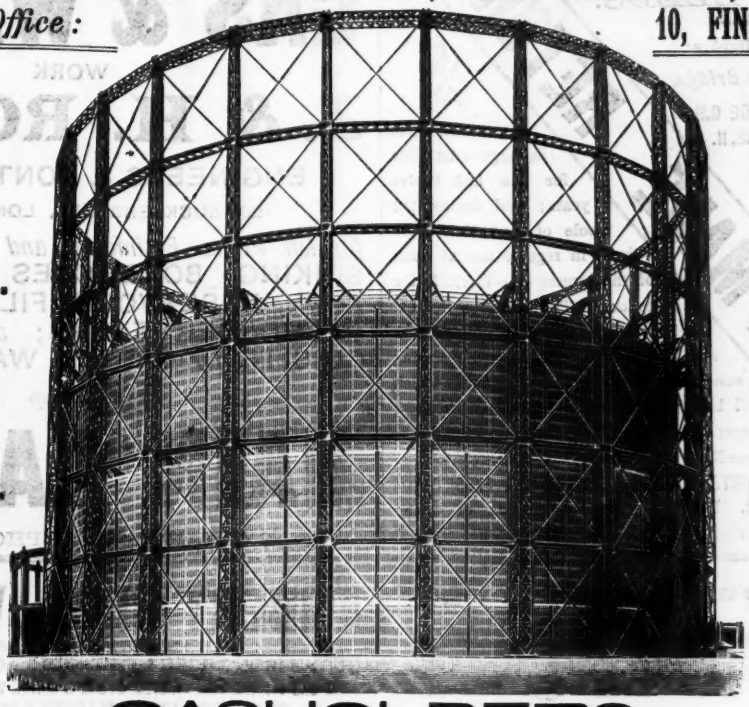

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Sole Makers of **WECK'S** Patent CENTRE-VALVE, & **CRIPPS'** Patent HYDRAULIC MAIN VALVE.

THE AUTOMATIC GAS-METER CO., LTD.,

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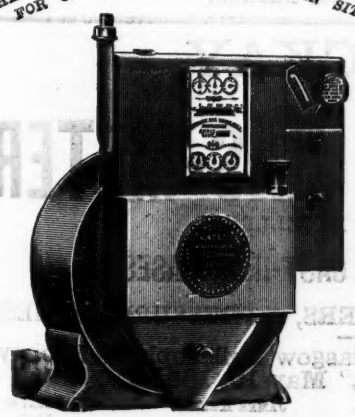
PENNY-IN-THE-SLOT GAS-METERS.

THE AMOUNT OF GAS GIVEN IN EXCHANGE FOR COIN CAN BE ALTERED *IN SITU*.



The persistent efforts of the Inventors of our Meters have been crowned with

SUCCESS.

There can be no two opinions on the question of the priority of our claim to the consideration of Gas Companies as *the First* Introducers, on a Practical Scale, of a Penny-in-the-Slot Meter.

THE AMOUNT OF CASH PLACED IN THE BOX IS RECORDED. THIS IS A COMPLETE CHECK AGAINST FRAUD.

PENNY-IN-THE-SLOT GAS-METERS.

So long ago as 1889, we advertised our Penny-in-the-Slot Meters as having the now fully-recognized advantage of ability to alter IN SITU the amount of Gas given per Coin. Automatic Meters without Coin-Counting Index are liable to be tampered with.

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Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.

Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

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furnish Plans, Estimates, and Specifications for SINKING BOREHOLES *and* WELLS; *Erecting* RESERVOIRS, FILTER-BEDS, *and* GASHOLDER TANKS; *and* EVERY REQUISITE *for* GAS *and* WATER WORKS,

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ENGINES,
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&c., &c.

RIVETS
FOR
GASHOLDERS,
BOILERS,
GIRDERS,
TANKS,
COVERS,
&c., &c.; ALSO
SET SCREWS,
WASHERS,
SPIKES,
AND
FISH-PLATE BOLTS.

Sole Manufacturers of the "PERFECT" Patent LOCK-NUT and WASHER.

ALDER AND MACKAY,
MANUFACTURERS OF
IMPROVED WET AND DRY GAS-METERS
IN CAST-IRON AND TIN CASES OF THE HIGHEST EXCELLENCE.

ORIGINAL MANUFACTURERS OF DRY METERS IN CAST-IRON CASES.

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Results of Tests of Dry Gas-Meters (Section III.) of the Glasgow Philosophical Society's Gas Exhibition, as per London "Gas Journal," May 10, 1881.

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Total of Fast Tests . .	47·2 ..	6·9 ..	33·6 ..	62·3 ..	53·7
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PATENT FLAT-FLAME LANTERNS,

From 30 to 1100 Candle Power.

THEY ARE SUITABLE FOR GAS OF EVERY CANDLE POWER,

MADE ENTIRELY OF COPPER.

THE "BRAY" REFLECTING LIGHT

Is an unequalled combination of SIMPLICITY, CHEAPNESS, and EFFICIENCY.

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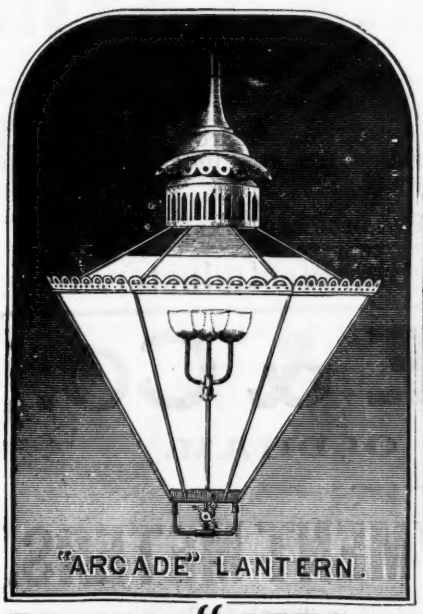

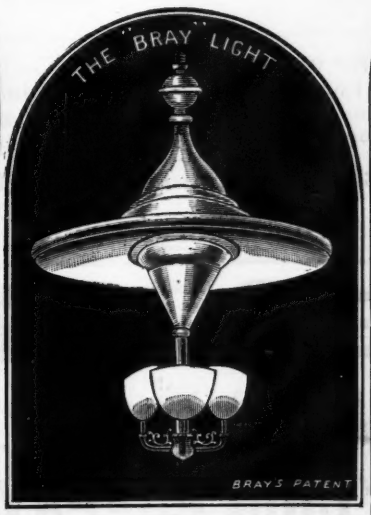

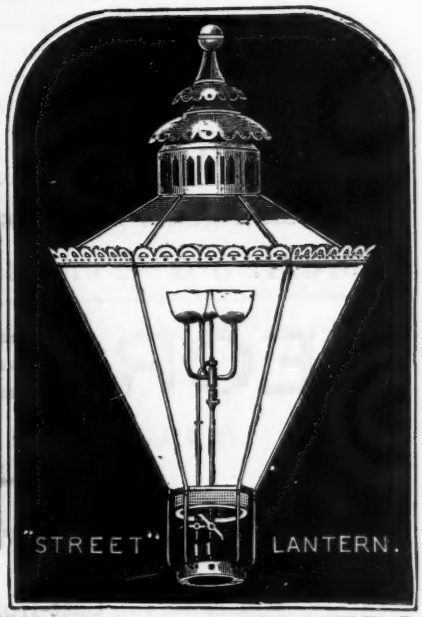

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Are the best in the Market for general use, and are very moderate in price.

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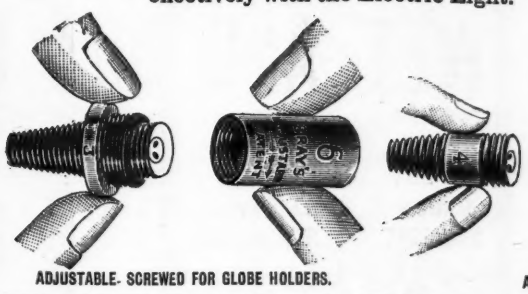
Gas Managers should try them on Consumers' Fittings; and they would see at once how to compete more effectively with the Electric Light.



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PATENT "STANDARD" WASHER-SCRUBBER.

☞ **483** of these Machines (capable of dealing with **464,340,000** cubic feet of Gas daily) in use, which fact is given as evidence of this apparatus being the Most Efficient of any in the Market for the extraction of Ammonia, Carbonic Acid, and Sulphuretted Hydrogen from Coal Gas.

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Sole Agents in Great Britain for Marshall's Patent Tar Extractor.

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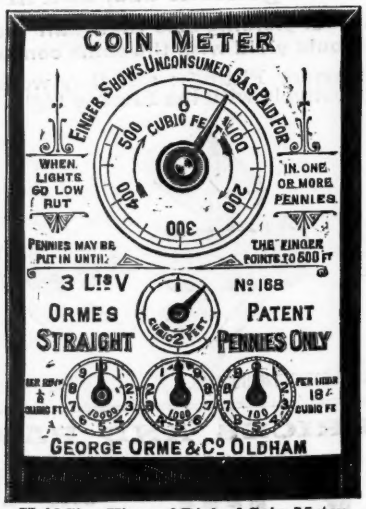
Wet Meters in Cast-Iron and Tinplate Cases. Dry Meters in Tinplate Cases.

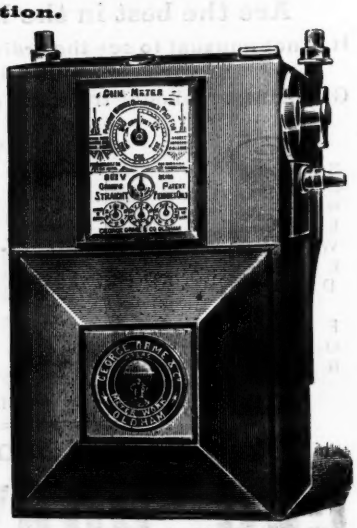
NEW PATENTED ARRANGEMENT FOR ALTERING THE SELLING PRICE OF GAS.

Full Particulars sent upon Application.

Wet Coin Meter in Tin-Plate Case.



Half-Size View of Dial of Coin Meter.



Dry Coin Meter in Tin-Plate Case.

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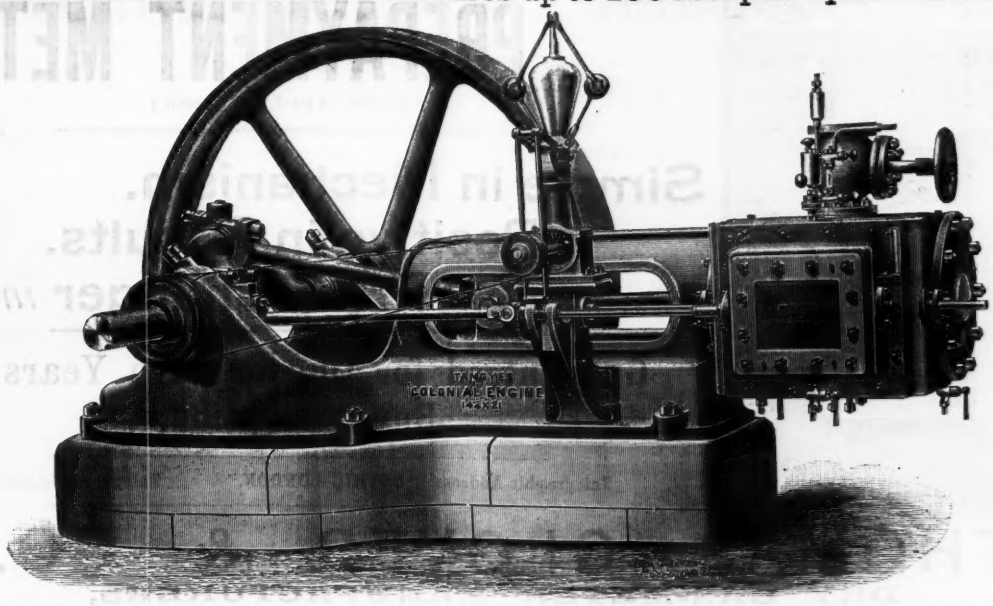
TANGYES'
"COLONIAL" STEAM-ENGINE

Constructed for Steam Pressures up to 100 lbs. per square inch.



Tangyes' "Colonial" Steam-Engine, with the TANGYE-JOHNSON PATENT AUTOMATIC CUT-OFF GEAR. From a Photograph of the 14½ in. by 21 in. size.

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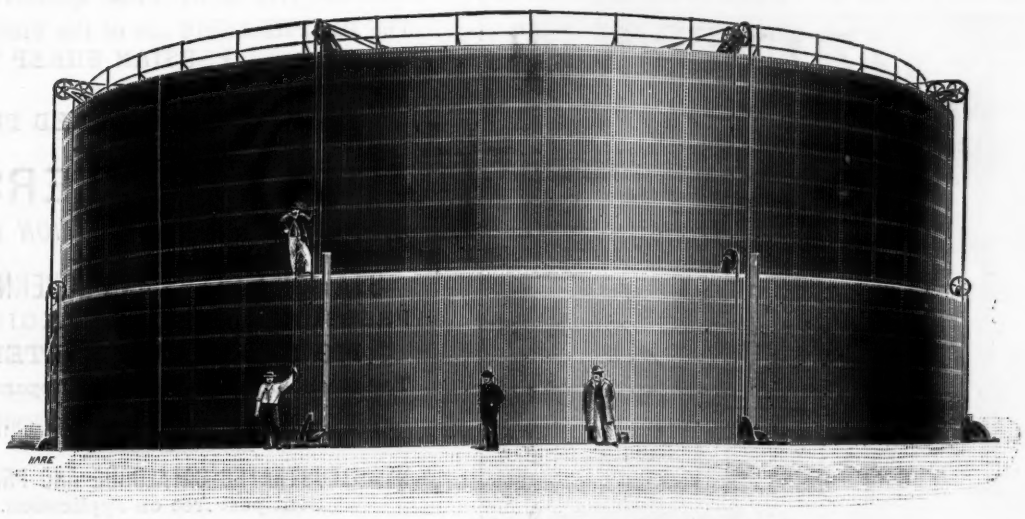

Illustration of BATHURST Holder, 82 feet diameter by 18 feet deep each Lift.

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MILAN (ITALY).	NEWBURN.	BIRKENHEAD.	IN AMERICA.

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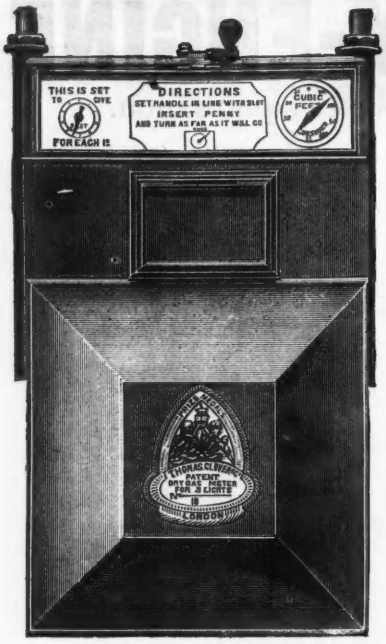

NEW IMPROVED PREPAYMENT METER.

(PATENT APPLIED FOR.)

Simple in Mechanism.
Positive in Results.
Price Changer *in Situ.*

Guaranteed for One or Five Years at Buyer's Option.

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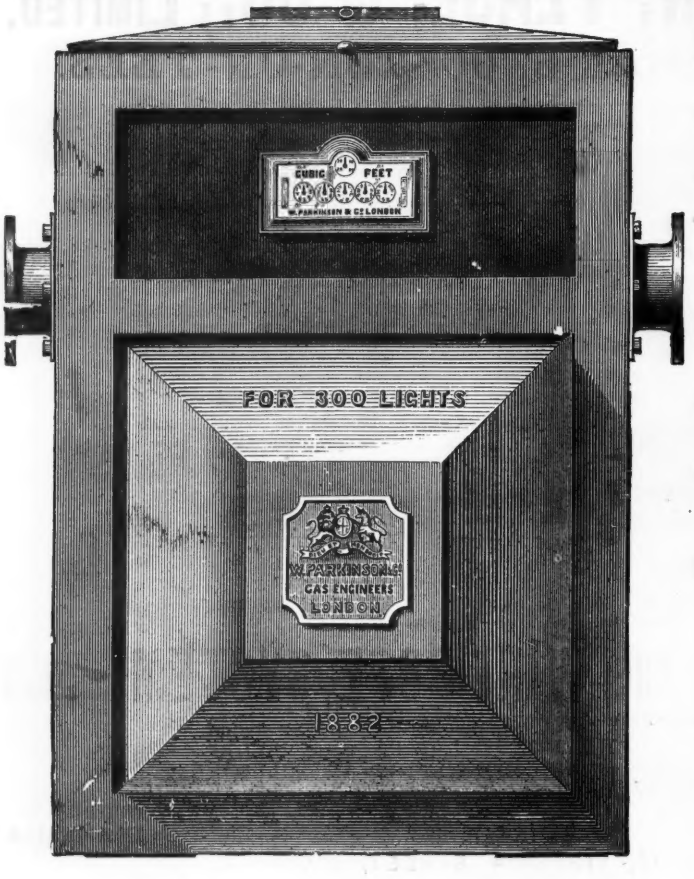

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TO CORRESPONDENTS.

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THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, OCTOBER 2, 1894.

The Selling Price of Gas under Municipal and Company Ownership.

IN another column will be found the text of an address delivered on Friday last by Mr. George Livesey, at the Goldsmiths' Institute, New Cross, to inaugurate a course of lectures on "Gas Manufacture," to be delivered by Mr. A. G. Bloxam and Mr. W. J. Lineham. The bulk of Mr. Livesey's remarks dealt with the historical side of gas lighting, with special reference to the development of the industry in the Metropolis. It is unnecessary to say anything here respecting the matter or the manner of this part of the address; for if Mr. Livesey is not a trustworthy guide through the intricacies of the history of the gas supply of London, it would be difficult at this time to find another equally competent authority upon the subject. In the course of his address, however, the South Metropolitan Chairman touched upon a point which also seems to have been uppermost in his mind when he spoke earlier in the week at Leicester upon the conditions of the local gas supply, as administered by the Corporation Gas Committee. On this occasion he also referred to the principle governing municipal gas supply in Scotland, which is strikingly illustrated in the report we give to-day of the action of the Edinburgh Corporation Gas Committee. The point is simply the familiar one of the expediency of municipalizing gas undertakings, in view of the actual results of the working of gas companies and corporation gas committees. Leicester, like the majority of English local authorities owning gas undertakings, takes a heavy toll out of the so-called gas profits, in aid of the borough rates. This practice is defended, in Leicester and elsewhere, first of all upon the ground that the ratepayers stand a theoretical risk in having the rateable value of the town mortgaged as security for the capital required for the undertaking; secondly, that the profits of the business do not all come out of the gas consumers, but are largely composed of contributions from outside buyers of residuals; lastly, that the gas is cheap enough, and is, in fact, cheaper than it was when supplied by a company. Mr. Livesey, in effect, traverses all these pleas; and the arguments on which he and those who share his opinions upon this matter rely may be summarized as follows, taking the points just mentioned in the reverse order: Gas is never cheap enough if it can be sold cheaper; and, under the influence of the sliding-scale and other conditions governing modern gas companies, this order of gas-works proprietors are quicker to make reductions of price, and sell gas as cheaply as, and often more cheaply than, local authorities who subsidize their rates out of gas profits. Local apologists for the latter order of gas-works administrators are careful to persuade their public that the gas is cheap; and they think this is proved by the fact of reductions in price having been made within historic times; but they omit to inquire what the price would have been if the undertaking had remained in private hands—as in Sheffield, Newcastle, and Plymouth. If it is objected that these are exceptional instances of company management, so surely is Leicester or Birmingham of Corporation control. It would be easy to cite instances of a different style of municipal gas administration, in which, notwithstanding, the undertaking is made the milch cow of the local authority. Again, the plea that gas profits do not come from gas consumers is one that applies to both orders of ownership, and since gas companies are not allowed to deal separately with the various contributors to their profits, there is no excuse for local authorities doing so. There only remains the question of the ratepayers' liability, which is nothing at all—certainly, nothing that justifies the substantial price paid in respect to it at Leicester and elsewhere. If there were anything in it, how comes it that Parliament permits Scottish ratepayers to run this risk without hope of recoupment? Moreover, it is obviously impossible that whatever responsibility of this nature exists can be discharged by present subsidies to ratepayers. The only way of extinguishing the ratepayers' liability is by redeeming the capital debt.

The sole reason admitted by Parliament as justifying the transfer of gas undertakings from companies to local authorities is that of expediency. The preamble to every Bill for legalizing such a proceeding says "it is expedient" that this should be done. Upon the ruling principle admitted in regard to Scotch transfers, this fundamental reason can be made out with little difficulty. It is unnecessary to go farther than Edinburgh to find proof of this; for here we see the Gas Department offering gas at rather less than the estimated cost price. It would be absurd as well as illegal to talk about gas being cheap enough in Edinburgh, for it is bound to be as cheap as possible, which is a very different thing. Granting, therefore, that the expediency, in the public interest, of Scotch gas transfers can be made out, how is it with English examples, actual and possible? The expediency must be shown with regard to the single point of the selling price of gas. This is the only factor that enters into the problem, for the interest of a local authority in obtaining control of the local gas undertaking consists solely in the prospect of securing cheaper public lighting, and of

improving and cheapening the gas supply to the town generally. Herein appears the divergence between the theoretical or ostensible and the actual motive of local authorities in getting possession of gas undertakings; for whereas the former is as we have stated it, the latter—in such cases as Leicester—is mainly the help which a gas undertaking can be made to afford to the municipal funds. Suppose that a local authority—say, the London County Council—promoting a Bill in Parliament for the acquisition of the London gas undertakings, were to support the plea of expediency, on the ground that it would suit them admirably to obtain, upon easy terms, a source of revenue independent of the rates, and consequently outside the immediate control of the ratepayers. Would the argument be likely to captivate a parliamentary committee? Yet it is incontestable that this is the "true inwardness" of the attitude of most English corporations towards the gas undertakings of which they have a hope at some time to become seized, in the name of Municipalism. It should hardly be necessary, but, to prevent the possibility of any misunderstanding arising as to the motive of our references to the case of Leicester in this connection, we desire to make it plain that this particular town is only cited as a representative of a principle. For the Corporation and the Gas Committee of Leicester we entertain the very highest respect in their administrative capacity as manufacturers and suppliers of gas. Their treatment of the gas undertaking is a model of what the administration of such a service should be; and it would be ridiculous to question that Alderman Lennard and his colleagues, who are responsible for the policy which directs the finances of the undertaking, are inspired by perfect faith in the fairness as well as by recognition of the practical advantages of their action in this regard. There is no point of right or wrong in the practice. Leicester has perfect liberty to decide for itself how it should be rated. The question is purely impersonal, and to be discussed wholly with reference to expediency; and we hold that considerations of expediency point to the superiority of the Scotch system, where they show that the municipalization of a gas undertaking is desirable on public grounds.

The Flash-Point of Lamp Oils.

In a letter of considerable length which appears in our "Correspondence" columns to-day, Mr. John Young, of Glasgow, expounds the Scotch view of the question of high or low grade mineral oil. We are glad to have this statement; and we hasten to assure our well-informed correspondent, and those for whom he writes, that we have no prepossession whatever in favour of American or any other description of mineral lamp oil, but regard this means of lighting generally as inferior in point of safety to gas. Our correspondent accuses the author of the article in *The Times*, upon which our remarks on the 4th ult. were based, of writing in the interest of the American oil trade. It may be so; but if he could be proved to be the whole Standard Oil Company in person, we do not see what difference it would make. We forget for the moment whether the Scotch oil refiners have ever professed to take an impartial view of the question of the flash-point of lamp oil; but they would be very foolish if they did. We have no patience with professions of impartiality on the part of those who join in discussions of commercial questions, and never pretend to the quality when dealing with the gas industry and its rivals and conquerors. So long as the truth is told, it cannot matter who tells it; and so long as they do not misrepresent the facts, it is quite open to American or Scotch disputants over the question of the flash-point of lamp oils to fill up the gaps in each other's stories. The Scotchmen insist upon magnifying the importance of the flash-point, because their interest lies that way. Of course, it is conceivable that they would be quite as keen to see danger in a low flash-point, if this chanced to be a characteristic of the Scotch product; but such does not happen to be the case. Upon comparing Mr. Young's letter with our article, we cannot find anything that needs correcting in the latter. Mr. Young says roundly that "if oil gives off inflammable "vapour when burning in a lamp, from that moment there "is danger." Well, and what must be the flash-point that will absolutely guarantee any mineral oil from giving off inflammable vapour in a lamp? Any user of metal bodied lamps will bear out the statement that, at the temperature attained by the parts about the burner of such a lamp after some hours' use, it cannot greatly matter what was the flash-point of the oil at starting, even if we are not to accept the statement that the higher the grade of the oil the hotter the flame, and the more likely to overheat the reservoir. There is no weight in the assertion of our correspondent that the present flash-point was fixed to suit the American producer, and to enable him to make Great Britain the dumping-ground for an article his own Government will not permit him to sell at home. This style of argument, if it can be so called, is of a piece with the sneer at Free Trade which follows. We suppose that the technical advisers of the Government in this matter acted as they considered for the best; and if they were wrong in fixing the flash-point too low, what must be said of the Germans, who have it lower still? Moreover, it is quite intelligible that an oil which would be practically safe for use in England would be unsafe in the warmer summer climate of the United States. The "incredible" statement, as Mr. Young calls it, of the correspondent of *The Times*, as to his having had an explosion with high-grade oil, is not "put forward" by us, but is given as we obtained it from the source named. After all, as Mr. Young admits, the matter in question is not one that either American or Scotch oil refiners are competent to settle. We doubt whether it will be settled in the sense he evidently hopes for.

The Unification of London.

The first stage in the creation of what may become the greatest Municipality of this or any age, was completed last Saturday, by the issue of the report of the Royal Commission appointed "to consider the proper conditions "under which the amalgamation of the City and the County "of London can be effected, and to make specific and "practical proposals for that purpose." The Commission was appointed in March last year, and consisted of Mr. Leonard H. Courtney, Lord Farrer, Mr. R. D. Holt (Mayor of Liverpool), Mr. H. H. Crawford (Solicitor to the City Corporation), and Mr. E. O. Smith (Town Clerk of Birmingham), with Mr. George E. Y. Gleadowe as Secretary. The report is signed by all the Commissioners, with the exception of Mr. Crawford, who withdrew from the Commission in the course of its proceedings. It is impossible in the space at our disposal to discuss in detail the recommendations of the report; but we can unreservedly join in the general tribute of admiration offered by the Press, even when hostile, for the ability shown by the Commission in their handling of one of the most intricate questions ever submitted to such a body. It is impossible to resist the impression produced by the report that the proposals contained in it are in harmony with the general course of Metropolitan evolution. It must be observed that the fundamental question of the desirability of unifying the local government of the Metropolis was not submitted to the Commission—this being taken for granted. What the Commission had to do was to suggest the shape which a unified form of local government could most easily and effectively take. This has now been done, and a coherent and homogeneous scheme for the municipal reorganization of London has been produced, which has the merit of following closely on the lines of general municipal legislation, and of being in harmony with the course of events in London itself. There is nothing in the scheme which immediately affects the administration of the gas supply, for it only provides for the vesting, in the new Municipality which is to represent all London, of the powers in this respect possessed by the existing Corporation and the County Council. It will naturally follow, however, upon the consummation of such a tremendous alteration of the system of Metropolitan government as that contemplated by the Commissioners, that the position of the Gas Companies will be likewise altered, relatively if not positively; but whether for better or worse it would be premature even to speculate. Meanwhile, the Commissioners' report constitutes instructive reading for all who are interested not merely in the government of London, but in British Municipalism generally; for, in discussing the best arrangement to be applied to the case of the Metropolis, the Commissioners have necessarily had to pass in review the circumstances and experiences of other Corporations, and it is satisfactory to learn that they have found in these more to copy than to condemn. Consequently, if there is to be a new Corporation of London, it will resemble, in a general way, the other

Corporations of the country, with modifications to allow for the effective control of the vast area to be dealt with.

The Cardinal Principle of Industrial Economics.

When, a fortnight ago, the article entitled "A Lesson in "Industrial Economy" appeared in the Journal, we had no expectation that the effort we then put forward, with the object of correcting the erroneous view taken by certain members of the Iron and Steel Institute respecting the reasons for the success of Belgian competition in their trade, would receive such prompt support as it has actually derived from the remarks of Mr. W. L. Wilson, Chairman of the Ways and Means Committee of the United States House of Representatives, at the dinner given in his honour by the London Chamber of Commerce on Thursday last. Our protest was made against the blindness of those employers of labour in the iron and steel trade who could see nothing but "cheap labour" at the bottom of the success of their Belgian rivals; and we defended that lately-won position of the science of political economy which maintains that well-paid labour is also the cheapest. Now, all readers of the daily newspapers have had an opportunity for learning how this question stands in the estimation of the American statesman who has been one of the chief movers in the endeavour to reform the United States Tariff which has made this such a memorable year in the political and economical history of the country. For the past twenty-five years, Mr. Wilson said, the United States have been following the policy of the Celestial Empire. During this period, the States have adopted the principles of commercial exclusion, which called off their ships from the seas, clipped the wings of enterprise and industry, and all for the purpose of upholding the protective system. "For a whole generation "the people of the United States were taught that "national greatness, individual prosperity, the higher wages "and welfare of the working people, and the general pros- "perity of the country itself, were dependent, not upon free "and stable government, not upon individual effort and "individual virtue, not upon the glory and enterprise of the "people engaged in the development of a new country, not "upon our ready invention and adoption of all the instru- "ments of modern production and distribution, not upon "the bounties of Providence that gave us a whole continent "for our country free from connection with the wars and "internal policies of other countries; but on Acts of Con- "gress taxing all the people for the benefit of a few, and "separating us from the commercial enterprise of the rest of "the world." So spake Mr. Wilson, who went on to show how the maintenance of the protective system was commended to working people of the States as necessary for the continuance of their better wages and higher standard of living as compared with "the so-called pauper labour of "Europe." The American workman is learning, however, that the interest of the manufacturer in M'Kinleyism is not the same as his interest in having plenty of work to do; and, best of all, both the intelligent workman and the candid employer are at one in knowing from experience "the vital truth that high wages to labour and cheap pro- "duction are not only compatible, but seem to go hand "in hand." It is perfectly true, as Mr. Wilson aptly observes, that the manufacturing supremacy of the world must eventually pass to that people and that country which has the largest supply of the basic materials of industry, the readiest and cheapest access to them, and which brings to their development the highest intelligence, the freshest results of art and science and invention, and the best business methods to their production and distribution. Very naturally, Mr. Wilson thinks this condition points to the future supremacy of the United States; but, whether he is right or wrong in this expectation, it is certain that the industrial rivals to be feared by our own people are not those who work long hours for little money, but those who make much money and do the most work for it. If there is any lesson in the history of trade and industry, it is that the most efficient, not the worst paid man makes the market his own. It is because we hold this to have been amply proved, that we oppose in these columns that tendency of Trade Unionism which aims at the imposition of the "Union stroke" as well as the "Union wage" upon the industries of Great Britain. The Union wage might be paid, and more, as is frequently done; but the other Union speciality would speedily ruin the country that permitted it.

WATER AND SANITARY AFFAIRS.

Sir John Evans, in a letter to *The Times* on Saturday last, has taken advantage of the prudent conduct of the East London Company in husbanding their water supply, to attack the report of the recent Royal Commission. He says the Commissioners "recommended the abstraction of "22½ million gallons of water daily from the valley of the "Lea, in addition to the 72 million gallons daily at that "time obtained from that source." Sir J. Evans places this in contrast with what he describes as the present condition of affairs, and sarcastically observes that "no "more practical testimony to the value of the report of "the Commissioners can be imagined." But Sir John neither quotes the Commissioners correctly nor does justice to the Company. He says the latter "are com- "pelled to cut off the supply to their mains at night," in order to economize to the extent of 10 million gallons of water daily. But the Company stated, some days before, that the shutting down of the service mains at night only took place in some parts of their district—a statement which agrees with the complaint from a local physician to which we referred a fortnight ago. The curtailment is not universal through the Company's area; and the 10 million gallons thus saved in the night are distributed during the following day. The report of the Royal Commissioners declared that the abstraction of 52½ million gallons per day from the Lea (which was the quantity taken at the time by the New River and East London Companies) was too great with the storeage then in existence. "But," the Commissioners went on to say, "if other reservoirs were "constructed adequately increasing the storeage capacity "on well recognized lines, the taking of 52½ million "gallons may be continued." From the wells in the Lea Valley, the Commissioners were willing to allow a maximum abstraction of 40 million gallons per day, in place of the 11 million gallons then drawn. But the main point consists in the proviso, with respect to the river supply, that there should be an adequate increase of the storeage capacity. It is this which the East London Company have undertaken to do, so far as they are concerned, and which Mr. Shaw Lefevre did his best to prevent. Allowance must also be made for the fact, which very many people are slow to apprehend, that there has been a failure of the rainfall, and a consequent deficiency in the springs, in some parts of the country, including a considerable portion of the county of Essex. The *Daily Chronicle*, while recording the fact that an Essex hamlet "within an hour and a half's "ride of London, is practically waterless," and was in the same predicament last year, yet declares that the plea of a "deficient rainfall" in the case of London and Leicester is simply "preposterous." Concerning the failure in the supply, the *Chronicle* says: "We suspect "the real reason is to be found not in the lack of rain, but "in the want of the methods of storing it."

This last averment of the *Chronicle* is not without some measure of truth. But the absence of the requisite works is not necessarily the result of remissness on the part of those who have charge of the supply. Certainly, Parliament and the County Council must share the blame of the present difficulty in East London, if fault rests anywhere. Neither is the partial suspension of the constant supply any evidence that the one thing wanted is to municipalize the undertaking. In London a Company is called to account; but Leicester enjoys a supply furnished by a Corporation. London, indeed, is happy compared with the Midland town. There the supply has been running down to the dregs; the reservoirs being within a few days of utter exhaustion. If Leicester had such a supply as East London is now receiving, its people would be well content; and there would be no fear lest the factories should have to stand still for lack of water. Yet in the Metropolis there is an outcry because part of one district is not enjoying a constant flow of water day and night. The Clerk of the Hackney Vestry is to ask the East London Company "under what authority they "act in shutting off the constant supply." The question is not one of authority, but of common sense. If water is running short, it must be economized. It is not the pleasure of the Company to restrict the supply; and if they had been allowed to exercise their own discretion in the extension of their works, the present emergency might

have been entirely averted. Now that a slight interference with the supply has come to pass, denunciations are uttered as if the circumstance were due to some arbitrary freak on the part of the Directors. "Really," says the weekly organ of the London County Council, "it is time "something definite was done to bring the East "London Company to their senses." It is asserted that the Company "rob the crowded eastern districts of water "every night." There is an assumption that the Company wilfully keep back the supply; and no heed is paid to the fact that they cannot give more than they get. To make the case clear, and to concert the best measures that circumstances will permit, the Company have invited the Local Authorities to a conference on the subject. But this is pronounced to be "audacious presumption." However, we observe that the Hackney Vestry are reasonable enough to instruct their Clerk and Medical Officer to attend any future conference to which the Company may invite them. Any such conference is calculated to remove some of the prejudice and misconception which a considerable portion of the public Press has only too diligently fostered against the Water Companies.

Mr. F. Carlow, formerly of Queensferry, has been appointed Manager of the Bonnyrigg and Lasswade Gas Company, in succession to Mr. Andrew Terrace, who has gone to Blairgowrie.

The Notification of the Metropolitan Gas Referees for the winter season, just issued, contains the usual intimation that the maximum quantity of sulphur allowable in gas during this period will be 22 grains per 100 cubic feet.

An Appointment at Penmaenmawr.—In response to the advertisement for a working gas manager in the JOURNAL for the 11th ult., Mr. Robert Dempster had about 80 applications; and he has appointed Mr. Edwin Grabham, formerly under Mr. Settle at the Knaresborough Gas-Works.

Messrs. W. H. Allen, Son, and Co., of Lambeth, have completed their new works at Bedford. They are built on a site adjoining the main line station, and are therefore most convenient to visitors—being only one hour's ride from London. We hope shortly to be in a position to give a description of the establishment, the plant in which is driven partly mechanically and partly electrically.

Increases of Salaries in the Bolton Corporation Gas Department.—At a special meeting of the Gas Committee of the Bolton Town Council last Wednesday, the following advances of salary were agreed to: Mr. W. Smith, Gas Engineer, by £50 per annum; Mr. Hooton, foreman at the Lum Street works, by £24 per annum; and Mr. A. Dearden, cashier at the gas offices, by £14 per annum.

North of England Gas Managers' Association.—We learn from the circular issued by the Honorary Secretary of the above Association (Mr. W. Hardie, of Newcastle-on-Tyne) that the thirty-fifth half-yearly meeting will be held in Durham on Saturday next, under the presidency of Colonel Sadler, J.P. Carriages will await the incoming trains at Durham Station shortly before noon, and the members will drive to Malton Colliery, to inspect the Simon-Carvès coke-ovens and bye-products works recently erected there. At the close of the inspection, the party will be conveyed back to the offices of the Durham Gas Company, where the President will deliver his Inaugural Address, and the usual business be transacted. The members will dine, on the invitation of the President, at the Rose and Crown Hotel.

The Use of Water-Meters for Checking Waste.—Owing to the re-assessment of houses in Syracuse (N.Y.), which was begun when the city acquired the water-works, water-meters are now, we learn from the *Engineering Record*, being adopted quite freely. The Registrar of the Water Department (Mr. E. N. Westcott) states that a house-to-house inspection was made in order to determine the number of fittings, size of service, and other matters of supply in each building. It was soon discovered that many places were receiving water from fittings which were not mentioned at all in the books of the Water Company; and accordingly it became necessary to increase the annual charge. The consumer usually demurred to this, and preferred having a meter set on the service. The average daily use of water through 1246 metered services was 1658 gallons; while on the 1969 unmetered services the daily supply was 2280 gallons. Mr. A. H. M'Alpine, the Superintendent of the Water Department of Columbus (Ohio), who is a strong advocate of water-meters, reports that the average consumption in that city is now about 120 gallons per head daily. He says that, except where meters have been put in, people do not pay for what water they use, but for what they are privileged to use—the quantity taken being far in excess of what they are entitled to. The only remedy is the meter. Measure the water to the people and make them pay according to the measure, and the consumers would quickly bring themselves within the bounds fixed by law; less pumping would be needed; and the imperative demand for more water would be largely diminished.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 663.)

THE general downward tendency in the Stock Markets which we noticed last week has persistently continued. Business during the week just closed has been uniformly quiet and dull; and prices dropped in proportion as profits were realized. One serious factor to cause depression was the illness of the Tsar, upon whose life the peace of Europe may be said, in a great measure, to depend. It being settlement week, fresh business was not much entered into. One result of the plethora of money is the letting loose upon the public of a lot of wild-cat Australian mining ventures. The public will never learn wisdom; and it is little good warning them not to rush blindfold into Foolhardy Goldfields. Business in the Gas Market was about an average. Considerable advances in point of value have again been made by most of the chief issues; and several of the minor undertakings have also improved, while but few have undergone a check. In Gaslights, the "A" opened strong, and steadily mounted up during the week; the closing prices being the best, and showing an increase of 3. Several of the other issues realized high prices; and improvements in the quotations of a few were effected. Little business was marked in South Metropolitans; but sellers could command almost any price. The "A" made a considerable advance; and the "B" also improved. In Commercials nothing was done, except two small bargains at special prices; but the quotations were put up a very moderate degree. Scarcely anything was done among the Suburban and Provincial division; and the only change was an advance in Brighton on *ex div.* quotation. Movements among foreign undertakings have been more chequered. Imperial Continental was put down a point, though the prices of marked transactions showed no falling off. Continental Union, on the other hand, improved. Most of the South American Companies present some improvement; but Bombay has receded from the high figures to which it has recently for some reason been advanced. The Water Companies remain in the same inactive condition, and just as strong; while two or three of them have improved.

The daily operations were: The Gas Market opened very firm, and remained steady with quiet business all day. San Paulo rose ½; and Pará, ¼. Lambeth Water advanced 1. Tuesday was more active, especially in Gaslight "A," which gained 2. South Metropolitan "A" improved 3; and Continental Union and Buenos Ayres debenture, 1 each. The buoyant tendency improved on Wednesday. South Metropolitan "A" and both Commercials rose 3 each; Gaslight "C," "D," and "E," 2; and Monte Video, ½; but Imperial Continental fell 1. Business was very quiet on Thursday; but the upward march progressed. South Metropolitan "B" and Brighton advanced 2 each; and Gaslight "A," 1. Kent Water rose 2. Friday was more active, and equally firm. Gaslight "H" gained 1; but Bombays fell ¼. Saturday was quiet; and quotations remained unchanged.

ELECTRIC LIGHTING MEMORANDA.

The Leicester Municipal Electric Lighting Station—The Lesson of the Leicester Installation—The Turning-down of Lights.

As was to have been expected, the members of the Incorporated Institution of Gas Engineers who visited Leicester last week were greatly interested in the new electric lighting undertaking of the Leicester Corporation, the administration of which has been confided to the Gas Committee, who have found room for the generating station at their Aylestone Road works. It will be remembered, by regular readers of this column, that when the Municipality of Leicester decided to supply the luxury of electric light to such of the townspeople as might be found desirous of having it, they thought they could not do better than consult Mr. Alfred Colson, their trusted Gas Engineer, upon the question of the system and plant to be adopted. He did not profess to be an electrical expert; although, as an experienced hand at dealing with all the problems presented by a lighting service, and a sound mechanic, he probably knew as much of the elements of the new branch of engineering as some who have posed as authorities upon it before Parliamentary Committees. At any rate, Mr. Colson caused the electric lighting requirements of the district to be made known; and he invited, from accredited electrical engineering firms, proposals for a scheme which he passed in review and reported upon by exercising in this behalf that critical faculty which Dr. Kennedy holds to be so necessary a part of an engineer's equipment. The result was the acceptance of the Brush Company's scheme, which is now being carried out with modifications that seem to indicate somewhat of the Ferranti influence. However this may be, it appears evident that the Leicester plant is going to generate the unit at as low a cost, and distribute it as effectively, as the same work can be done by any installation in the kingdom. The Gas Committee engage that, while giving the new branch every legitimate assistance

in the shape of housing, administration, cheap fuel, and the benefit of their business experience, they will make it stand on its own footing, so that the town shall know exactly what the business can do for itself. This is perfectly right and proper; and such treatment as the electric lighting industry has so far received, and will receive, at the hands of the Leicester Gas Department, should go far to dispel the stupid calumny that those interested in gas supply entertain the smallest sentiment of jealousy of central station electric lighting, or are concerned in putting obstacles in the way of its development.

The more the Leicester example is studied, the clearer does it become that it constitutes a strong proof in support of the observation which chairmen of gas companies are often induced to make for the comfort of timid and ignorant shareholders, and for which they are so often rallied by the electrical press—that they have no fear of the electric lighting industry. It is generally overlooked by the electrical critics who are so fond of telling chairmen of gas companies that they "protest too much" in this regard, that in so doing they are merely whistling like a boy in the dark to keep up their courage, and so forth—that gas property is almost exclusively held as a permanent investment, and very largely as an inheritance by helpless and nervous people with no knowledge of business. These persons nevertheless read the newspapers; and not being versed in the way of the electrical world, they do not know how much "salt" to take with the florid statements and prophecies relating to the imminent supersession of gas by electric lighting which notorious professors, Fellows of the Royal Society, government officials, and other lights of the world of science, are in the habit of scattering broadcast—mainly, of course, as ground-bait for the fat consulting fees they hope to catch. Consequently, it is to their trusted agents in the employment of their little capital that perplexed holders of gas stock look for the annual or half-yearly word of assurance that enables them to sleep o'nights. They do not realize how purely a matter of business it is when Mr. Professor mounts the platform and tells whoever will listen to him that now is their chance for going in for a good thing in the way of electric lighting—cheap as dirt, and certain to pay well in the end. They may have been led to believe that men of science are above this sort of thing, and would reject with scorn the suggestion that Dr. Dulcamara, F.R.S., Ph.D., M.Inst.C.E., and so on, has an eye to the main chance in decrying the prospects of an industry which has no occasion for his valuable advice; but those who live in the world know how it wags. As the gas chairmen speak, so the Leicester Corporation acts. It has a heavy stake in the local gas undertaking, which contributes largely to the municipal treasury, and represents a heavy capital responsibility. Yet the Corporation are providing a cheap electric light supply, and buying the best plant they can find for the purpose; and we have no reluctance in wishing them success with it.

Quite an electrical storm in a technical teacup has been raging over the recently described invention of a Birmingham genius for turning down incandescent lamps with saving of current. Mention was made of this notable invention in the issue of the JOURNAL for the 11th ult.; and about the same time our electrical contemporaries fell foul of the inventor for wasting his ingenuity in attempting to do what is not worth doing, and at no inconsiderable expense. Mr. Sharp, the inventor in question, has defended himself by averring that he does save a good deal of current by his device for turning down an electric lamp, and also gets thereby a "pleasant mellow light." It does not appear, however, that this is the object for which, in the ordinary way, any light, whether electric or of another kind, is turned down. People do it with a view to saving the lighting medium, whatever it may be, while only a watch-light is needed. It so happens that this can only be done effectively in the case of gas lighting. Nobody thinks of turning down a gas-burner for the mere purpose of obtaining a "nice mellow light;" because it is sufficiently evident to the most careless user of gas, that a very small check to the consumption, below that proper to the burner, makes a disproportionate difference to the lighting effect. On the other hand, when it is only desired to keep in a light ready for instant full use, this can be done by burning a mere glimmer of gas, consuming as little as one-tenth of a cubic foot per hour. Old-fashioned people used occasionally to turn down their colza oil moderator lamps; and this was an economy, because the unconsumed oil flowed back into the lamp reservoir. It was soon discovered, however, that there was no economy in trying the same thing upon a mineral-oil lamp, which has a way of making itself very disagreeable if not kept fully at work. And with incandescent electric lighting, seeing that a lamp which gives an illuminating power of 16 candles at the full pressure of 100 volts for which it is made, drops to a glimmer of about half a candle at a pressure of 60 volts, it is difficult to understand what advantage is to be gained by what may be called "turning it down." Even a drop of 5 per cent. from the normal pressure means a loss of 25 per cent. of light from the lamp. Consequently, it would appear that, with lamps of the ordinary make, at any rate, it is not only simpler to modulate their light by putting them inside a stocking, or some equally effective screen, instead of "turning them down," when it is desired to use them as night-lights, as the custom is said to be in London hotels; but it is also as cheap a way of attaining the desired end as can be suggested.

THE DESIGN OF LAMP-COLUMNS.

IN the issue of the JOURNAL for Aug. 28 (p. 416), M. Maréchal's book descriptive of the lighting of Paris was reviewed; and some of the lessons to be learnt from it by the authorities who are responsible for the public lighting of the cities and towns of the United Kingdom were also pointed out in the editorial columns. Upon page 417 of the number in question, mention was made of the new model lamp-columns now employed in the best streets of Paris. As these were stamped by M. Maréchal with his approval, as being of "really satisfactory appearance," we have deemed it desirable to furnish readers of the JOURNAL with further particulars of these fittings; and on p. 649, through the courtesy of Messrs. Baudry and Co., we are enabled to reproduce the illustrations given by M. Maréchal of the two most popular patterns of lamp-columns in the "Oudry" style. Fig. 1 is used for streets where the sidewalk is upwards of 2·40 mètres wide; and fig. 2 is the new method of lighting narrow footways, dispensing with bracket lamps, and thus rendering the lanterns and their supports independent of the house façades. In this case, the lantern is fixed at a height of about 5 mètres, or considerably higher than is thought necessary for the curb lanterns.

Before describing the special points of these lamp-columns, it will be instructive to follow M. Maréchal's disquisition upon the elements of street lighting as it is practised in Paris, by means of the common batswing burner, consuming gas at the normal rate of 140 litres (4·944 cubic feet) per hour. The illuminating power of Paris gas, by the same writer's showing, is 15·2 candles upon the English scale—that is to say, it is gas of about the same quality that can be obtained from Newcastle and Durham coals without carburetting. In point of fact, the Paris Gas Company do carburet their gas by means of English cannel; but this is because they carbonize principally the coal raised in the Pas-de-Calais, which yields a gas of only about 13-candle power. Moreover, it is generally held by English gas engineers who have looked into the subject, that such an estimate as that of M. Maréchal of the average illuminating power of Paris gas is distinctly too high. To return, however, to the street-lamp fittings. The regulation Parisian street-lamp batswing burner is described by M. Maréchal as composed of "a little iron tube, of 4·5 millimètres interior diameter, terminating in a button split vertically." The width of the slit is 0·6 millimètre. This was determined as the result of some interesting experiments conducted by MM. Audouin and Bérard upon the working of batswing burners. It was ascertained that burners of the type adopted by the City of Paris, had a maximum luminous duty when the width of the slit was 0·7 millimètre, and the gas escaped under a pressure of from 2 to 3 millimètres of water. Practically, a slit of 0·6 millimètre has been chosen, in order to obtain a stiffer flame, and one less susceptible to the influence of draughts of air. The pressure of gas at the burner should then be 3·5 millimètres of water. As there is no mention here of non-conducting burner-tips, or any other of the small but valuable improvements effected by English makers in the flat-flame burner, it may be considered that the Paris authorities have something to learn about these appliances.

The same reflection arises in regard to the treatment of gas pressure. The pressure in the mains, as M. Maréchal admits, is far superior to 3·5 millimètres of water. This is reduced to that required at the burner itself, by merely checking the rate of flow through the lantern-cock—surely, an archaic method. It is remarked that regulators may be used for this purpose, and that this is done in a large number of towns. M. Maréchal thinks, however, that the working of these appliances leaves something to be desired; and he does not question the wisdom of the policy adopted in Paris of systematically avoiding their use. Here, the verification of the pressure at the burner is confined to simple inspection of the flame. "With a properly regulated burner, the flame exhibits perfectly determined dimensions, being 7 centimètres wide and 6 centimètres high." The regulation of the flame falls to the Company's lamplighters, who are supposed to keep well on the right side in this matter, because flames that are too small give occasion for the imposition of fines. Consequently, says M. Maréchal complacently, the regulation rate of consumption is often exceeded by the street-lamps; but this is hardly a worthy way of regarding the matter. There are in actual service in Paris 50,000 of these regulation street-lamp burners, besides others.

These burners are placed in glazed lanterns, made of sheet brass; the metal being composed of 67 parts of copper to 33 parts of zinc. An ordinary round lantern weighs (framework alone) 12·36 kilos, or over 27 lbs. The lanterns are either square or round in cross section. The former are generally used for lamp columns of cast iron simply painted; the round lantern is reserved for the coppered columns. In our illustrations, fig. 1 shows a round lantern; and fig. 2, a square one. The square lanterns are provided with a triangular sheet metal trap in the bottom, for the admission of the lighting rod; and the round ones have a glass sector, for this purpose, moveable on a vertical axis. The burner is fixed in the middle of the lantern, and so oriented that the plane of the flame is perpendicular to the line of street frontage. The lantern cock is inside the lantern, and is so arranged that the lever is horizontal when the cock is closed. Thus any shaking of the soil tends

to open instead of to close the cock. In some places, as M. Maréchal remarks, it is the practice to put the cocks outside the lanterns; but in Paris it is preferred to place them inside, whereby they are kept warm and escape naphthalene obstructions. The tops of all lanterns are now fitted with porcelain reflectors. They are issued from the municipal stores, and fixed by the Gas Company at an agreed rate.

Lighting and maintenance of public lamps devolve upon the Gas Company. Lighting and extinction are done at a charge of 3 c. each per day, at times fixed by the Prefect. A latitude of 20 minutes before and 20 minutes after the fixed time is allowed to the lamplighters; and M. Maréchal so far breaks through his rule of chronicling the facts without criticism, as to say that he thinks this margin excessive. It is admittedly due, however, to the time occupied by the lamplighter in regulating the cock to give the normal size of flame; for a margin of only 10 minutes each way is permitted in respect to the time for extinction. This being understood, it might be thought that the Municipality would have reason for reconsidering the antiquated policy of dispensing with automatic pressure regulators, since it can hardly be claimed that the human agents for discharging this duty are as infallible as they are slow. The hours of street lighting are calculated for Paris at 3737·92 per annum. The show of exactitude to the second place of decimals is very characteristic. The maintenance of the lanterns comprises daily cleaning, and making good broken glass. This is done by the Company for 1 c. per day for square lanterns, and 3½ c. per day for the round ones, which sum includes the painting of the columns, where this is done.

All lamp-columns belong to and are issued by the Municipality, who contract for their supply by special manufacturers. They are erected and maintained by the Company at agreed prices. As already remarked, the Municipality have abandoned street wall-brackets for various reasons, and have adopted bracket-posts in their stead for narrow streets. The new model columns are either bronze painted, or coppered by the Oudry process. M. Maréchal does not state how often the painting is renewed; but all lamp-columns are washed at least once a month, and the coppered columns are waxed monthly. The coppering costs £4 10s. per column, which is admittedly dear; but the effect is considered to be worth the expense. The process, however, is not the best that could be selected, inasmuch as the copper is not deposited directly upon the iron, but upon a preparatory coat of varnish and blacklead. Hence the contact of the copper coating with the iron is not perfect; and the latter is quickly destroyed by galvanic action upon exposure to the weather. M. Maréchal confesses that this is a drawback of the system, which, indeed, cannot be recommended on any account. The maintenance of its coppering costs for an ordinary column 0·0049 fr. per day.

The street-lamp columns are always placed at a minimum distance of 0·55 mètre from the outer edge of the curb of the pavement, and are fixed in a block of masonry 1 mètre square and 0·70 mètre high. The lamp service is of lead, of 27 millimètres (over 1 inch) internal diameter, rising to the top of the column, where it is connected by a plumbers' joint to a copper nipple which screws into a covering plate. All the lamp-fittings are of copper. An Oudry lamp-column, with round lantern, costs complete 270 frs., of which 112 frs. goes for coppering. The casting itself costs only 39 frs.; the lantern, 47 frs.; and the fixing, on the average, 72 frs. A coppered bracket-column costs altogether 247 frs., if fitted with a round lantern; and 241 frs. with a square lantern. In all cases, doing away with the sophistication of coppering would result in great saving of first cost and maintenance charges. We shall not concern ourselves here with the designs and cost of the various special patterns of streets lamps and columns to be seen in Paris on the principal bridges, squares, &c. M. Maréchal admits that some of these have "more or less happy forms;" and most impartial critics would incline to think that the ambitious "rostral" columns of the Place de la Concorde and the front of the Opéra come under the latter classification. It should be remarked that the column illustrated in fig. 1 can be adapted with good effect to carry three lanterns.

It may be asked why the patterns of lamp-columns which we have selected for illustration deserve to be praised so highly. Of course, taste goes for something in these matters; and it is not to be expected that the same model of lamp-column will commend itself to everybody. Yet it must be perceived that there is such a thing as good, in opposition to bad taste in such things; and the patterns in question may be used as texts upon which to hang a brief discourse upon the points of design to be looked for in a street-lamp column. It is not pretended that the Oudry patterns are of unique merit, although they are demonstrably good. Our English ironfounders may have equally satisfactory patterns in stock; but we shall not be open to the charge of partiality for a particular home foundry, if we base our remarks upon the Parisian product. To begin with fig. 1, it will be perceived at a glance that it is unsuitable for the neighbourhood of a Gothic building. It has a style of its own, which is more than can be said for the column in fig. 2. This latter has a very fitting appearance of desiring to escape notice. The other column, on the contrary, while not obtrusively ornate, is patently a lamp-post in its best dress, and consequently fit to appear in really good company. It would not disgrace any locality where the Renaissance spirit is most in evidence. Moreover, the whole thing is sound, appropriate, strong, and suitable for its purpose. Rooted in a massive base, which assures the rectitude of the column under all ordinary vicissitudes, the general taper of the column is preserved through all the cross mouldings that gratefully break the outline; and there is no sudden constriction such as might strike the uninstructed as a bit of elegance, but would cause the experienced moulder to shake his head. Again, the shaft is distinguishable from the base; which makes the lantern at top look like a proper finish, in the form of a third member, to the whole erection. Thus the column has a beginning, a continuation, and an end—which is essential in a work of Art. It must have struck everyone who has seen them, that street-lamp columns which start as it were from the ground, and have no marked base, are never satisfactory. Then again, the ornamentation here employed is of a character that goes well with a casting. The wreathed floral enrichment upon the shaft is happily conceived, and gives an effect very true to the nature of the means employed to produce it. It does not pretend to be turned work, nor twisted, nor a petrified rope, nor anything other than it is; consequently the whole thing looks consistent. Coppering such a lamp-column is, of course, abomination only less blameworthy than gilding would be. M. Maréchal admits that the coppered lamp-columns of Paris have to be waxed and polished, to render them less "loud" of aspect; but it would be better to adopt a different and more honest style of treatment altogether.

Enough has been said to show how the design of a lamp-column may be judged; and it only remains to be observed that there are as many acceptable styles of design in these fixtures as there are orders of architecture and types of localities to be suited. If lamp-posts cannot be made to range in expression all the way "from grave to gay, from lively to severe," they can be rendered much less offensive to an educated eye than they too often are, without adding to the cost of the service.

Institution of Civil Engineers.—In view of the approaching opening of the new session of the above Institution, the Council have issued the usual circular inviting original communications on subjects of professional interest. For approved papers, the Council have power to award premiums, arising out of special funds bequeathed for the purpose, particulars of which are furnished. In order to assist in the selection of a subject, a comprehensive list is given, with instructions for preparing communications. Among the subjects suggested are the following: "The Methods of Enriching Gas for Illuminating Purposes, and their Relative Advantages;" "The Working of Inclined Retorts;" "The Design and Construction of Modern Gasholders of Large Size;" "The Application of Oil and Gas Engines to Traction Purposes on Tramways and Common Roads, and to Marine Propulsion;" "The Losses that Occur in Gas-Engines, and Means for their Reduction, with special reference to 'After-Burning;'" "The Relative Merits of the Several Cycles in Gas-Engines;" "The Utilization of Electric Lighting Plant during Hours of Small Demand;" "The Application of Water Power, and its Transmission to a Distance by Electricity;" "Investigations as to the Quantity of Water Yielded by the Chalk Formation;" "Purification of Sewage by Filtration, Precipitation, Electrolysis, and otherwise;" "The Means and Appliances, other than Sewers, for Dealing with the Refuse of Towns."

Laying Mains under Water.—A recent number of the *Engineering Record* contains an account of an interesting piece of pipe-laying work lately carried out at Port Jervis (N.Y.) under the direction of Mr. Irving Righter, who furnished the particulars given by our contemporary. The pipe, 8 inches in diameter, was laid across the Neversink River, at a place where the stream is 120 feet wide and from 6 to 7 feet deep for 80 feet of the width; the remainder of the distance being shallow. The bed under the deeper part of the river is fine sand, and elsewhere gravel and coarse cobble. The work was done by means of a floating platform of oil-barrels and timbers, which could be moved up and down the stream, and would not be submerged by high water, if this had occurred. Ordinary 8-inch cast-iron pipe was used, with flexible joints every 26 feet—each alternate joint being solid. Ten lengths of pipe were coupled together, making a total length of 130 feet, which gave a good landing on either shore. The first joint on each side was solid. The current at the time the work was executed was 15 feet a minute—not enough to be noticed. A trench for the main was excavated at each bank with picks, shovels, and rakes and scoops specially made for the purpose; but there was no excavation at the centre. The platform was made by joining 40 barrels in two rows, 4 feet apart longitudinally, and 3½ feet in the other direction. This raft was calculated to support a weight of 16,000 lbs.; and the load, including the weight of 20 men, was estimated to be 12,000 lbs., and the raft sank to within 6 inches of the tops of the barrels when in use. The pipe rested upon 3 in. by 4 in. timbers extending across the space between the barrels; and it was lowered by means of tackle from six frames. A few diagonal braces were put on these frames above the pipe, to allay the apprehension felt by some that the sides might separate, although no such tendency was detected. The lead connection of one of the ball joints was slightly drawn during the lowering of the pipe, but was hammered up tight without much trouble. After the main was laid on the bottom, it was covered with "riprap" and gravel.

TECHNICAL RECORD.

AUTUMN MEETING OF THE INCORPORATED INSTITUTION OF GAS ENGINEERS.

A goodly proportion of the members of the Incorporated Institution of Gas Engineers, together with a few of his professional friends, accepted the invitation to an autumn meeting at Leicester, on Tuesday and Wednesday of last week, which Mr. Alfred Colson had issued in his capacities as President of the Institution and Gas Engineer to the Leicester Corporation. The programme for the meeting, as detailed in the JOURNAL for the 18th ult., was of an exceptionally attractive character, which doubtless accounted in part for the success of the fixture; but we prefer to believe that this was due in even greater measure to the high place which Mr. Colson holds in the regard of his professional colleagues both in and out of the Institution, and to the obligation felt by all loyal members of this comparatively young organization to show, in the best way open to them, their sense of the President's hospitality, and of the value of the opportunity for indulging in a day or two of mutual intercourse before the setting-in of the winter, which, to gas managers more than the followers of any other calling, means a season of isolation, toil, and strain. It is enough to say of last week's meeting, in general terms, that it proved more than satisfactory to both host and guests; while its effect upon the prospects of the Institution cannot but be favourable. Here it may be as well to make admission of a consideration which was present in the minds of most of Mr. Colson's visitors during the two days of instruction and enjoyment provided for them on so lavish a scale last week as to make the Leicester meeting a life-long memory—it is, that no technical institution can reasonably expect all its gatherings to be maintained on such a high level of completeness, of liberality, and of varied interest. It was not that the smallest leaven of personal or professional ostentation found its way into Mr. Colson's scheme of entertainment for the Institution whose welfare he has at heart; no one having the slightest acquaintance with him could harbour any such suspicion of his motives in this respect. The truth of the matter is that the present Gas Engineer to the Corporation of Leicester occupies a peculiar niche in the gallery of eminent living exponents of the science and practice of gas manufacture and supply. He has made this position for himself by reason of the ability and devotion with which he has attacked every duty that has fallen to, or been thrust upon him, in his by no means easy post under a Municipality which flatters itself as being among the most progressive of English local authorities. Having first shown himself worthy of Leicester, Leicester, to its credit, has not been inappreciative of the merits of the Gas Manager; and so it has come about that the President of the Incorporated Institution of Gas Engineers for this year has been able to do for the organization what few others, however well inclined, could possibly have accomplished. Hence there must be no drawing of any invidious comparisons between this year's autumn meeting of the Institution and any that may follow it. The members generally are fully in accord with this proposition; and, indeed, they would be unworthy of their order, and the principles which the Institution is intended to maintain and symbolize, if they could not appreciate the spontaneous and public-spirited kindness of one exceptionally-situated President, without degrading it to the mean use of disparaging the endeavours of his successors in an office which all representative professional men may be called upon to serve in their turn.

One of the most gratifying features of last week's meeting was the evidence which it furnished of the willingness of the leading townsmen of Leicester to assist the President in receiving and making the members' visit pleasant and instructive. The same spirit was manifested throughout the two days' proceedings; the party never being left without the countenance and company of some one or another prominent member of the Corporation. The first event in the programme was a reception on Tuesday morning by the Mayor (Mr. Israel Hart, J.P.), supported by a strong contingent of aldermen and town councillors, which took place in the Council Chamber, at the Town Hall—a handsome apartment, be it observed, and a commodious, whereof also the acoustic properties leave nothing to be desired in this regard. The Mayor spoke well, and was well followed by Mr. Alderman Lennard, the Chairman of the Corporation Gas Committee, whose reputation as a municipal gas-works administrator is more than local. The acknowledgments of the Institution were paid in fitting terms by the President, and by Mr. G. C. Trewby.

This function terminated, the party were driven in brakes, by way of the London Road, to the Wheatsheaf Boot and Shoe Factory of the Co-operative Wholesale Society, Limited, where the visitors were received and conducted over the works by Mr. John Butcher, the Manager, who, with his assistants, was most painstaking in explaining the manifold and intricate operations by hand and machine that go to the making of a modern boot. From here the route was through the village of Aylestone to the Corporation gas-works, where the visitors were received by the Chairman (Alderman Lennard), the Vice-Chairman (Mr. Billings), and other members of the Gas Committee, and different groups were conducted over the model establishment by the Superintendent (Mr. E. W. Frost), the Superintendent of the Belgrave Gas-Works (Mr. T. Wilson), and Mr. H. E. Clayton, the Engineer's General Assistant. It is unnecessary to say anything here in praise of the Aylestone Road gas or chemical works, which have been fully described and illustrated by Mr. Colson himself in the valuable contributions he has made to the published Transactions of the Institution. The gas-works are among the first of their size in the kingdom in point of design and management. The planning and elevation of the principal buildings of the station has been almost uniquely successful in producing a certain effect of stateliness and substantiality; while nothing like straining after architectural airs and graces is anywhere noticeable. This pleasing aspect of the Aylestone Road works was doubtless rendered more easy of attainment than it would be in some localities by the quality and colour of the building stone and brick which Midland gas engineering constructors have at their command; but the order and "civility" of Mr. Colson's work in design are none the less to be credited with high quality because it has received satisfactory material embodiment. If an additional word of praise is needed for these works, regarded as a gas manufacturing station, it should be awarded for the quietness, cleanliness, and ease in operation that arrest the attention and extort the admiration of the professional critic. On Tuesday, at any rate, the too-familiar gas-works odour was not noticeable in the vicinity of the Aylestone Road; and Mr. Colson achieved the distinction of showing a party of technicians over his works without having an exhibition of retort drawing and charging, which stamps him as a gas manager of the highest originality of mind.

At Aylestone Road, moreover, in addition to accommodating works for the chemical treatment of the residual products of gas manufacture, house-room is found for the electric lighting station upon which the Corporation have recently ventured; and we believe that Mr. Colson is the only gas engineer in the kingdom who has been entrusted with the supervision of a work of this kind. Reference to this new branch of Mr. Colson's duties has been made from time to time in the JOURNAL. We believe that, when the installation is completed, Leicester will have in it as good, as it certainly is as cheap, an example of this kind of work as can be found anywhere; and if, after all, the service does not pay the Corporation, this result will be due to commerical reasons, and not to defects of plant.

While the visitors were at the gas-works, the very excellent Leicester Corporation Gas Department Band, under the conductorship of Mr. C. V. Palmer, played a thoroughly good selection of music; and a short demonstration was given by the Ambulance Division of the department (who are the holders of the Leicester Challenge Shield for this service), under the direction of Mr. R. James. In all this, as well as in the equipment of the workmen's reading and recreation room, in which luncheon was served, the humanitarian inspiration which governs the treatment of their employees by the Leicester Corporation is conspicuously manifest; and they do not go without reward. The luncheon was as good as—after a long morning's perambulations in soaking rain—it was acceptable. Besides the Mayor, there were present at Mr. Colson's hospitable board the Chairman and Vice-Chairman of the Gas Committee, Alderman Sir Thomas Wright, J.P., Mr. Alderman Wood, J.P., —specially noteworthy in this connection as the Chairman of the Gas Committee who was instrumental in the appointment of Mr. Colson to Leicester—and many other leading townsmen. There were only a few toasts; but in the course of a speech in which Mr. George Livesey proposed that of the Mayor and Corporation of Leicester, he enlivened this part of the proceedings by telling the Corporation that their policy of taking so much money as they do every year out of the gas profits in aid of the rates is, in his opinion, hard upon the gas consumer. This was "bearding the lion in his den" with a vengeance; and the Chairman of the Gas Committee lost no time in meeting Mr. Livesey's criticism, which he did in perfect temper by using the familiar plea that the ratepayers bear the risk of the investment in the local gas property, and have a right to be recouped accordingly. Of course, there can be no public controversy upon this question upon such an occasion as that which on Tuesday last brought the Chairman of the Leicester Gas Committee and Mr. George Livesey face to face; but it would not be difficult to show that, in point of fact, while this obligation to the ratepayers is purely theoretical, the burden of it upon the gas consumer is in some towns very actual. Mr. Livesey may or may not have had in his mind another local authority and another body of gas consumers nearer home, when he hinted to the Leicester Corporation that they are making the gas consumer pay for the advantages of municipal control of the gas supply, so that this important section of the community derives no pecuniary benefit from the arrangement. He made one of the local newspapers very angry, at any rate, on account of his venturing to disturb the local doctrine that the gas supply of Leicester is as cheap as it is unquestionably profitable to the Corporation and helpful to the rates, when so well managed as it is in this case. When mismanaged, as it unhappily is in the case of certain municipalities less wise in their generation than that of Leicester, the ratepayer still clamours for his subsidy, although the gas consumer suffers. But this consideration, if followed further, would lead into a wide digression.

The afternoon of Tuesday was occupied by visits to the spinning-

mills of Messrs. Fielding and Johnson and the hosiery manufactory of Messrs. W. Raven and Co. During the evening, the Art Gallery and Museum were opened specially, through the kind offices of Mr. Biggs, the Chairman of the Museum and Art Gallery Committee, who was present for the purpose of explaining the circumstances which attended the acquisition of these invaluable educational aids by the town. Mr. Montagu Browne, the Curator of the Museum, was also in attendance, and showed the visitors the greatest kindness in describing the treasures under his charge.

Wednesday was devoted to an excursion by rail and road to and through the "Dukeries," lunching at Edwinstowe—also by invitation of the President. Mr. Alderman Wood accompanied the party; and, the weather having improved, the trip was thoroughly enjoyable in every way. All the arrangements for both days, which must have given the President a considerable amount of trouble in the preparation, were perfect; and, under his energetic leadership, they worked throughout without a hitch. Indeed, nothing was spared by Mr. Colson, or his associates in this matter, that could be thought of to render the autumn meeting of the Incorporated Institution of Gas Engineers a success in every way; and they have the satisfaction of knowing that these efforts were appreciated to the full by the members who were able to attend, and who were for their part numerous enough to give their host the countenance his efforts deserved.

MR. GEORGE LIVESEY ON THE INCEPTION AND DEVELOPMENT OF GAS LIGHTING.

In connection with the Goldsmiths Company's Technical and Recreative Institute at New Cross, S.E., a course of lectures on "Gas Manufacture" will commence on Friday next. In the first ten lectures, Mr. A. G. Bloxam, F.I.C., will endeavour to cover the wide field of the chemistry of gas manufacture; and in the succeeding eighteen, Mr. W. J. Lineham will describe the plant and apparatus used in gas making, distribution, and consumption. To render the lectures as intelligible as possible to the class of students for whom they are intended, they will be illustrated by numerous diagrams and experiments; and the students who are afterwards successful in the examination will be awarded certificates by the City and Guilds of London Institute. The lectures were inaugurated last Friday evening by Mr. George Livesey, who delivered an address which was attentively listened to by a numerous audience—indeed, the marked interest which was displayed foreshows, it may pretty safely be said, a successful run for the lectures. In the absence of Sir Frederick Abel, who had been expected to preside, Dr. Dallinger occupied the chair. After a few introductory remarks from the reverend gentleman,

Mr. LIVESEY delivered his address as follows:—

The Managers of the Goldsmiths' Institute having done mg the honour of inviting me to give the address inauguratine a course of 28 lectures on "Gas Manufacture," I desire, in the first place, to thank them for this gratifying recognition of the importance and stability of the coal gas industry, and to express the hope that their effort will be appreciated as it deserves, and that the able and devoted lecturers will be rewarded by large and attentive audiences of students and others interested in the manufacture and supply of that useful servant of the public —coal gas. Moreover, this being the first time I have had the honour of sharing, in a small degree, in the work of the Goldsmiths' Institute, I take the opportunity of strongly commending it to the attention of all, especially the young, who are able to avail themselves of its great privileges and opportunities of instruction, recreation, and social improvement. By so doing, the great munificence and public spirit manifested by the Goldsmiths' Company in founding and maintaining the Institute will meet with the acknowledgment most desired by the founders.

I am here, however, to endeavour to say something interesting on a rather large question—gas lighting, which has contributed in no small degree to the comfort and convenience, the safety, and the progress of this and other nations during the present century. Artificial light is so necessary, and coal gas is so common, that few people now give it a thought, except on those rare occasions when, like all other human inventions, its want of perfection is proved by some defect in its supply or use. Attention was probably first drawn to it in the form of natural gas issuing from the earth, which ignited on the application of a light; and one observer—the Rev. Dr. John Clayton, Dean of Kildare—rather over 200 years ago, not being satisfied with merely applying the light at the surface, had a hole dug, and found what he describes as a "shelly coal," from which the gas appeared to issue. This led him to distil some coal in a retort; thus producing coal gas. This he collected in bladders, and amused himself and his friends by pricking a hole with a pin, and, to use his own words, "compressing gently the bladder near the flame of a candle till it once took fire. It would then continue flaming till all the spirit was compressed out of the bladder, which was the more surprising because no one could discern any difference in the appearance between these bladders, and those which are filled with common air." And for a very good reason, because it was nearly 100 years later—towards the end of the last century—that the great chemists of that period first discovered and isolated the various gases composing air, water, &c., which are now known, by name at least, to every schoolboy.

Nothing practical, however, came of the possibility of producing gas by the distillation of coal. It was then called inflammable air, until William Murdoch, a native of Scotland, in 1792, when residing in Cornwall, directed his attention to the quantities and qualities of the gas obtained by distilling various mineral and vegetable substances; and being struck with the great quantities of gas, the brilliancy of its light, and the facility of its production from coal, he made experiments, with the view of ascertaining its suitability for the purpose of artificial lighting. On his return to Scotland in 1797, he lighted his premises at Old Cumnock in Ayrshire with coal gas. In 1798, he was engaged by Messrs. Boulton and Watt, at the Soho Foundry, Birmingham, in the manufacture of steam-engines. There he erected an apparatus on a large scale, by which one of the principal buildings was lighted; and, in 1802, in celebrating the Peace of Amiens, the whole front of Boulton and Watt's buildings was publicly illuminated with gas. In 1804, F. A. Winsor, a German, lectured on gaslight in London, with the object of forming a National Light and Heat Company, which he, in his enthusiasm, estimated would yield a profit exceeding 100 millions a year, with the result that in 1806 he was supported by a large and influential body of subscribers, who, encouraged by the first public street lighting with gas, which took place in Pall Mall on Jan. 28, 1807, formed a Committee, which met on July 12, and may be considered the first official assemblage in connection with the Chartered Gas Company, who in 1810 obtained their first Act of Parliament, and in 1812 received a Royal Charter of Incorporation, whence they derived the name of the "Chartered" Company. In 1813, they had the good fortune to engage Mr. Samuel Clegg, formerly a pupil at the Soho Works (who had been occupied since 1805 in the invention of apparatus and the design and erection of gas-works for mills, manufactories, and private houses), as their Engineer. Under his direction, their works were constructed; and on Dec. 31, 1813, old Westminster Bridge was lighted with gas.

Other Companies soon came into existence. In 1814, both the City and the South London (afterwards called the Phœnix) Gas Companies were formed, and others rapidly succeeded them in the course of the decade, not only in London, but in many important provincial towns. No sooner, however, was a company fairly started than a competitor or competitors usually followed, with the result that much money and energy that might have been profitably devoted to the improvement and general extension of this important business, was wasted in fighting each other, to their own loss of profit, and the injury of the public. The consumers themselves were largely responsible for this competition, as they were very frequently the promoters of competing companies, which were generally started for the avowed purpose of reducing the price of gas; and although this object was usually attained at first—accompanied generally by a reduction of the already very meagre dividends to the vanishing-point—the after-effect was that the consumers had to pay interest on a very much larger capital than would have been necessary had competition been avoided. In very early days, Sir William Congreve—the Government Inspector of Gas-Works, on the ground of safety, strongly urged the Chartered and City Gas Companies to adopt districting arrangements in the City of London. But the City Company were strongly opposed; and only on Government threatening to bring in a Bill to enforce districting was a voluntary arrangement made, whereby each Company had allotted to it a separate district. In the City of London, this arrangement remained in force until 1850, when the Great Central was started to supply the whole of the City, in opposition to the existing Companies; but throughout nearly all the rest of London competition prevailed. The Directors and officers of the various Companies derived much greater satisfaction in taking consumers from rival Companies than in obtaining new ones. Such is human nature; truly man is a fighting animal. And so the game went on for forty years—gas dear and dividends low—until competition became intolerable. It was not at all unusual for three, four, and occasionally even five different Companies to have mains in the same street, and often on both sides. This was the case to my knowledge in 1853, in the Walworth Road, where the Phœnix, South Metropolitan, London, and Surrey Consumers' Companies each had mains on both sides. Therefore there were eight mains, where two would have been sufficient, and where at the present time there are only two. The streets were continually being opened, for the consumers were constantly "ringing the changes" between the Companies, either on their own motion or at the solicitation of the rival inspectors; and great public inconvenience and loss, as well as confusion and quarrelling between the Companies, were the result.

The death-blow to competition was given soon after 1850, in which year the Great Central Company was started to supply gas in the City, and the Surrey Consumers' Company in South London. The price of gas was then 6s. per 1000 cubic feet. Mr. A. A. Croll, the founder of both these Companies, undertook to supply gas at 4s. per 1000 feet; and as the old Companies obstinately and foolishly would do nothing in response to the public agitation that was at that time set on foot to obtain a reduction of price (a reduction to 5s. would have

sufficed, if in time, but it came too late), those Companies came into existence, and all the Companies were then forced in self-defence to reduce to 4s. This had a double effect. It caused a heavy loss to the Gas Companies, necessitating a considerable reduction of the dividends. They had been paying about 5 per cent., and that of the South Metropolitan was 6 per cent.; and all had to come down. But there was another and unexpected effect. The new Companies had, before starting, obtained promises from many thousands of consumers to take the gas—as was natural with such a bait as a reduction of 2s. off 6s.—from them. But when the old Companies came down to 4s., large numbers of the consumers would not change. Consequently, the working of the new Companies was not so rosy as had been expected; and, so far as I know, these were the last competing Gas Companies that were actually started in the kingdom. Competition had been thoroughly tried; and it had failed, for in 1853 the four Southern Companies (including the new one) entered into a districting arrangement whereby South London was so divided that a separate and distinct district was allotted to each Company. The price was raised from 4s. to 4s. 6d. per 1000 cubic feet; and an unbroken period of prosperity for the Gas Companies, and a cheap and efficient supply of gas to the consumers, was entered upon. In 1857-58, the example of the South was followed in the North of London; and in 1860, the private districting arrangements of the Companies were approved and confirmed by Parliament. From that time, competition gradually ceased all over the kingdom. Where it existed, arrangements have been made; and Parliament has consistently refused to sanction new competing gas companies. The number of Gas Companies in London proper about the year 1850 was fifteen. They have now, by amalgamation, been reduced to three; and there are in addition twelve other smaller Companies supplying gas in the suburbs—including such places as Croydon.

In the early days, the dividends were either wanting altogether, or they were very small. The average dividend paid by the Chartered Gas Company during twenty-eight years up to 1840 was less than 2½ per cent.; and until districting had time to produce its effect, nearly twenty years later, anything above 5 per cent. was very uncommon. But since 1860 the maximum dividend allowed by Parliament has generally been paid; while the price of gas has been reduced to about one-half of what it was in 1860. In this part of London, it was then 4s. 6d. per 1000 feet; it is now 2s. 4d.

Although the gas-meter was invented by Clegg in 1815, it was many years before it come into common use. Gas was generally supplied by contract, at so much per burner burning for so many hours each night; and inspectors were appointed to visit the shops of the consumers, to inspect their burners and to see that they used them only during the stipulated hours. This was an extremely unsatisfactory arrangement. The Companies had to charge an average price per burner sufficiently high to pay them, with the result that the honest and conscientious consumers paid much more than they ought to have done, to make up for the waste and dishonest use of gas by the unprincipled, who objected most strongly (and for a long time successfully) to the use of meters, until in self-defence the Companies at last resolved, by mutual agreement, to supply only by meter.

When meters were first introduced, the price of gas in London was 15s. per 1000 feet, reduced in 1832 to 12s.; and then, by steps, to 8s. in 1843. It was 6s. in 1848; 5s. in 1850; 4s., under pressure of competition, in 1851; 4s. 6d. in 1853; 4s., again in 1862; and then, by steps of a few pence, and latterly by single pennies, to its present price of 2s. 4d. in this district. These reductions are the result of a variety of causes. Improvements have been effected in manufacture, whereby, with other advantages, more gas is made out of the coal. Then there is the lower cost of materials—coal among the number; but this is due to the substitution of steamers for sailing ships, whereby freight from Newcastle has been reduced to about 3s. 3d. per ton, which alone accounts for 4d. of the reduction that has taken place in the last twenty-five or thirty years. This is an "unearned increment" for the consumers supplied by the three London Companies, of about half-a-million a year. Labour, on the other hand, has gone up from 50 to 100 per cent.; the wages of skilled workmen having advanced in the last fifty years about 60 per cent., while the wages of labourers, which in 1838 were 2s. 6d. a day of 10 hours (or 3d. an hour), are now 100 per cent. higher, or 6d. an hour. One result, however, of the increase of wages—especially during the last five years—has been the extensive substitution of machinery for hand-labour; thus materially reducing the number of men in proportion to the work done. The introduction of machinery is an element in the reductions of price; but probably the chief factor has been the enormous increase of business. I am able to give some figures for the Old Kent Road works, which will forcibly illustrate this point. The works were started in 1833; but in 1843—50 years ago—7744 tons of coal were used, producing 72,567,000 cubic feet of gas, or 9371 feet per ton. In 1893, 176,255 tons were used, producing 1,784,426,000 feet of gas, or 10,123 feet per ton. The coal used has, therefore, multiplied about 23 times, and the gas made 24¼ times, in 50 years. To put it in another way, about the same quantity of gas was made in one week last winter as was made in the entire year 1843. Again, in 1843, there were at those works five gasholders, whose total contents were 213,000 cubic feet. There are now eight, whose total contents are over 11 million cubic feet, or about 50 times as much. The largest gasholder in 1843 at the Old Kent Road works contained 69,000 cubic feet; the largest now there has a capacity of 5½ millions, or about 80 times larger, while this is less than half the capacity of the Company's largest holder at East Greenwich, which will hold above 12 millions.

The increase in the capacity of gasholders has greatly reduced their relative cost. The 69,000 cubic feet holder was erected in 1840, and cost over £40 for each 1000 cubic feet capacity, and many years later £20 was a very moderate price. But the 12 million feet holder at East Greenwich cost only £5 per 1000 feet; the total being a little more than £60,000. Had it been at the rate of even £20 per 1000 feet, it would have cost about £250,000. The interest on the amount saved is about £10,000 a year, which means a reduction in the price of gas to that extent to the benefit of the consumers.

The capital employed by the South Metropolitan Company was in 1843 £100,000, or at the rate of 32s. per 1000 cubic feet of gas sold; in 1893 it was 3½ millions, or only 10s. 7d. per 1000 feet. This great relative reduction of capital in proportion to the business is vastly to the benefit of the consumers. It is due to improvements in construction and working, coupled with, and to a considerable extent caused by, the increase of business. If the capital now were as high per 1000 cubic feet as it was in 1843, and the present average nominal dividend of 9¼ per cent. were paid, the price of gas would have to be increased from 2s. 4d. to 4s. 2d. per 1000 cubic feet.

In most ordinary businesses, it is the main object of the proprietors or conductors to obtain the highest possible price for their goods. With gas the reverse is the case. It is now generally recognized and adopted in practice that it is to the advantage of gas companies to sell gas at the lowest practicable rate. By the original system of legislation as applied to gas companies, they had no inducement to reduce the price. They had a monopoly of a certain district, and they were permitted to charge such a price as would give them their full authorized dividends. This was fatal to enterprise and effort; and as they were allowed, as their businesses increased, to make new issues of shares at par to existing shareholders, they certainly had no inducement to economize capital, but rather the other way. Under these circumstances, it is much to the credit of the managers of those days that, as a rule, the capital relatively to the business was gradually reducing, though not so fast as otherwise it might have done.

In 1875, however, a new system was introduced in the shape of a sliding-scale of price and dividend, whereby the companies were authorized to increase their dividends ¼ per cent. beyond the standard rate for each penny reduction in the price of gas below a fixed initial figure. The initial price is 3s. 9d. for the north of London, and 3s. 6d. for the south. On the other hand, if the price is raised above the initial rate, the dividend must be reduced ¼ per cent. It is consequently to the direct pecuniary interest of the shareholders to sell gas at the lowest price possible; and the result has been satisfactory both to shareholders and consumers—the former getting increased dividends following, and in consequence of, reductions of price to the latter.

In 1876, as a complement to the sliding-scale Mr. (now Lord) Farrer, then Secretary to the Board of Trade, induced Parliament to adopt as a Standing Order what are known as the auction clauses in relation to gas companies. He, in effect, said that for the future no more capital bearing a high dividend should be issued at par, but at the market price. It was to be sold by public auction or tender; the premium received, if any—and it has usually been considerable—to go as capital into the business, without bearing interest. The result has been that since 1876 all new capital created by gas companies has been raised at about 5 per cent. instead of the nominal rates of 7, 7½, or in some cases 10 per cent.; thus materially reducing the charge for interest on capital, which the consumers have to pay in the price charged for their gas.

The sliding-scale has given a strong impulse to adopt measures to increase the business, which, although not at the old rate of doubling every ten years, is going on satisfactorily at a rate still very considerably in excess of that of the increase in the population. The consumption of gas in South London has doubled in the last fifteen years. Prior to 1870, the only competitors gas had to meet were candles, and oil at about 4s. or 5s. per gallon—sperm oil was even more than that—resulting in a practical monopoly for gas. With the advent of petroleum, and later the electric light in an available form, the case is entirely altered. Gas has fierce competition, and no monopoly as a lighting agent. Burning oil can be bought for pennies where it formerly cost shillings; and with exceedingly cheap lamps, an excellent light is obtained at a very low rate. On the other hand, there is the brilliant, but expensive, electric light, whose advocates and promoters have done all in their power, since 1878, to supersede gas. It is a singular coincidence that this period is the same as that referred to above in which the consumption of gas in South London has doubled. This shows that, against cheap petroleum and the electric light, gas not only holds its own, but continues to gain ground at a most encouraging rate. Let it be remembered that the greater part of the above-named increase is in the demand for light. It is true that the last ten years have seen a great extension of the uses of gas for purposes other than lighting—as a source of

power, in the gas-engine, cheaper and more convenient than steam; for domestic use, chiefly, though not exclusively, for cooking, which, for cleanliness, handiness, and economy, is so superior to a coal fire that those who have once used gas for this purpose will not willingly do without it; for an almost infinite variety of manufacturing purposes in a great number of different businesses; and for heating by means of gas-fires, which are in great demand. In all cases where a fire is wanted at short notice for a limited time, nothing is better or more economical than the gas-fire; but it is rather more costly than a coal-fire, where it is used for all or the greater part of the day.

There does not appear to be scope for much improvement in manufacture, so far as turning out a better article is concerned. Most of the improvements have for some time been in the direction of a reduction of cost. In the matter of purity, there is very little more that can be done. Crude gas, as it comes from the coal in the retorts, contains many impurities—two or three of them in large quantities. Some are readily condensed by the simple operation of cooling, such as tar and water, which, in passing from the state of vapour into liquid, absorb and carry away considerable amounts of the gaseous impurities. These consist of sulphuretted hydrogen, ammonia, and carbonic acid, with some other compounds of sulphur, such as bisulphide of carbon. The most objectionable impurity, owing to its quantity and noxiousness—sulphuretted hydrogen—is always absolutely removed. Ammonia also is so far taken out that nothing but the slightest trace is left—imperceptible to all ordinary tests; and of carbonic acid none remains. There is, however, an irremovable trace of sulphur in other forms or combination than sulphuretted hydrogen; but this is reduced to a perfectly inappreciable quantity—to about one part in 2000 parts of gas by weight. So small, in fact, is the proportion of this impurity left in the gas, that a delicate chemical operation, extending usually over 24 hours, is necessary—that is, the gas has to be burnt in a special manner for 24 hours—in order to discover the quantity contained in the gas. There are no known means for removing this last trace of sulphur; and there would be not the slightest appreciable benefit to the consumer if it were removed. In the matter of purity, therefore, nothing further needs to be or can be done.

It may not be out of place here to refer to a very common popular error while on the question of purity. The only so-called impurity of which the public complain is what is called smokiness, or, to use their own expression, "dirty gas," because in gas-lighted rooms the ceilings become blackened sooner than in rooms where gas is not used. In the first place, I would say that, even where gas is not used, where a current of air impinges on a ceiling (as is the case in the neighbourhood of hot-water pipes), there the ceilings become, in a comparatively short time, as "black as your hat," due to the particles of dust contained in the air being driven by the air current on to the ceiling. In the case of gas, a current of air is driven straight on to the ceiling: and the air contains innumerable particles of dust, many of which are charred in passing through the flame. There is also the carbon of the gas itself, which, if it is not properly consumed, undoubtedly adds to the blackening effect. But the carbon is not an impurity; it is the life of the gas—in fact, it is the source of its light. To take out the carbon would be to render the gas non-luminous; and even with a non-luminous flame there would, for the reason above given, be a blackening of the ceiling, though not to the same extent as with luminous gas. Moreover, the greatest amount of light is obtained when the gas is on the verge of smoking. Therefore, those burners which overburn the gas, and develop little more than half the light obtainable by good burners, produce the least smoke, but such burners cannot be recommended. The ideal method of burning gas is to convey the products of combustion entirely away from the room by means of a flue in the ceiling. If architects and builders would construct such flues, the most perfect ventilation could be attained by utilizing the heat of the gas for that purpose, and the gas would then not only give light, but would at the same time ensure the removal of its own and of all vitiated air. Reverting to the blackening of ceilings, it now appears—much to the surprise of a good many people—that the incandescent electric light, and even the wires when they are near the ceiling, will produce that effect.

This question naturally leads to the subject of burners. For a very long time—in fact, until between 30 and 40 years ago, very little thought or attention was given to this most important question. To give some idea of its importance, the cost of gas may, in effect, be doubled or trebled by unsuitable burners; and, on the other hand, it may be reduced to a similar extent by using those which best develop the light the gas is capable of yielding. About forty years ago, Dr. Frankland showed that, the hotter the flame, the greater the amount of light; and it is by the application of this principle that the high lighting effect of the regenerative burners is produced. But the practical application of the principle enunciated by Dr. Frankland was not embodied in burners that the public could use, even in a crude form, until about twelve years ago, since which time many improvements have been made. It is, however, to Mr. Sugg (of gas-burner fame) that gas companies and the public are mainly indebted for the improvement of ordinary burners. He showed that the most light was obtained from ordinary flat-flame and Argand burners when the gas was burnt at a low pressure, and when the flame was on the verge of smoking. When London gas was consumed under these conditions, he obtained the light of 3 candles for each foot of gas burnt per hour—that is, a 5 feet an hour flame gave a light equal to 16 candles; whereas many of the old burners gave only 2 candles per foot, and some, when the gas was burnt at high pressure, would not afford as much as one candle light per foot of gas—or 5 candles, where 15 might be obtained.

The street-lamps may be cited as a case in point. Before Mr. Sugg's improvements, the light generally given by them was about half of that at present produced from the same quantity of gas. This great advantage was obtained by enlarging the diameter of the holes in Argand burners, and by increasing the width of the slits in flat-flame burners. This enabled the gas to issue in thicker streams; but it would only have caused a greater consumption, without much proportionate increase of light, had not governors or pressure-regulators been introduced to reduce to a very low point the pressure at which the gas issues from the burner. The fishtail burners that were so common—in which there are two small holes in the centre, placed at such an angle that two streams of gas on issuing impinge on each other, and spread out into a flat flame, in shape somewhat like the tail of a fish—need a comparatively high pressure to make the flame spread out properly; and for this reason they are the worst burners that can be used for London gas. I am glad to say they have fallen very much out of use, and should be discarded entirely, because they give the smallest quantity of light per foot of gas burnt.

In Mr. Sugg's improved burners, the principle enunciated by Dr. Frankland was adopted, by using non-conducting steatite instead of metal for the tips of the burners; thus consuming the heat of the flame. But this principle has now been carried very much farther in the regenerative burners, in which the heat produced by the combustion of the gas is used for heating both gas and air prior to combustion. This enormously increases—more than doubles—the light obtainable from a given quantity of gas. Forty years ago, many burners in common use did not give 1-candle light per cubic foot of gas burnt per hour, and very few gave more than 2 candles. By Mr. Sugg's improvements, this was increased to 3 candles (and rather more) per foot. The regenerative burners have raised the duty per foot of gas to 7 candles, according to an impartial authority—Mr. Dibdin, the Chemist and Chief Gas Examiner for the London County Council. Some of these burners give even higher results.

The latest improvement is, however, far in advance of any of the preceding; for its advocates claim that, for every foot of gas burnt per hour, a light equal to 20 candles can be obtained. But something must be deducted for its use in ordinary average conditions; and this it can well afford. Even then its effect will be about double that of the best previously attained. I refer to the incandescent gas-burner, by which the light is obtained on an entirely different principle from that hitherto adopted. It is true that, strictly speaking, the light of an ordinary gas-flame is due to incandescence—the particles of carbon in the flame being raised to a white heat. Consequently, the hotter the flame, and the longer the particles of carbon can be retained in the solid form, the greater the light. This is effected by causing the gas to issue in a comparatively thick stream, at a low pressure. The incandescence is, however, due to a component part of the gas itself—its light-giving quality, the carbon—whereas with the new incandescent burner the light is due solely to the heat-producing power of the gas, for which non-luminous is quite as good as, or perhaps better than, luminous gas. The gas in this case is burnt with a mixture of air, on the principle of the Bunsen burner, giving a non-luminous flame. The burner is of the Argand form; and on it is placed a "mantle"—a piece of network in appearance like open woven cotton or lace, the size and shape of an Argand flame. This is heated to incandescence by the burning gas. This mantle is composed of various refractory oxides which are unaffected by heat, the composition of which, explained and illustrated, would, if practicable, form an interesting item in the Chemical Section of the lectures about to be delivered.

These successive improvements in the method of burning gas quite put into the shade, from an economical point of view, all other improvements in connection with coal gas. With the incandescent burner, gas at 6s. per 1000 cubic feet would be cheaper than gas at 1s. per 1000 feet burnt in a good fishtail burner, as fishtails go of 40 years ago; or, to put it the other way, with gas at 2s. 4d. per 1000 feet—its present price—the effect of the improved burners is practically to reduce the price to less than half or even one-quarter that figure.

The consumption of coal for gas making is about 12 million tons per annum in the United Kingdom. In London and its suburbs alone, it was 3¼ million tons in 1893; and the maximum quantity used in one day in the depth of winter in Greater London would be about 18,000 tons, or 750 tons an hour. Such figures, however, give no adequate idea of the quantity. I will therefore put it in another way, to show the extent of the business. One day's supply of coal of 18,000 tons would fill 6000 3-ton waggons. Each with its pair of horses would occupy about 7 yards, or about 250 waggons to the mile. A train of such waggons a mile long would therefore give one hour's supply; and for the 24 hours, they would extend from London Bridge to some distance beyond Gravesend. To come closer home (I think the sixth milestone from London Bridge is somewhere near the

farther end of Blackheath), one day's supply of coal for London, if put into such waggons, would make four lines along the whole of the Great Dover Road from Blackheath to London Bridge. They would, in fact, fill the road four deep for the entire length of 6 miles.

But the importance of the gas industry does not consist in its great extent, but rather in its usefulness and necessity to the community. In the first place stands the part it plays as a means of safety and protection. Evil does shun the light; and the evil prevented by the friendly gas-lamp, although impossible to calculate, is none the less a very real and tangible benefit to the teeming population of this great city. The question may well be asked whether the population could have grown to anything like its present extent had gas lighting not been introduced. For this essential purpose of public protection, it is absolutely necessary that the supply of gas should be reliable; and it complies with this condition, for although—owing to local defects or accidents—a light here and there occasionally goes out, such a thing as the gas-lights going out throughout any district is quite unknown. I never heard of such a thing happening in London—in fact, it can hardly be considered as possible. For instance, take the district in which we are now assembled. The Gas Company have six manufacturing stations; and every one is in direct connection with the entire network of mains—a network which is connected together at every possible point. It would be impossible to say at this moment whether the gas now before us comes from East Greenwich or from the Company's other works on Deptford Creek, or from the works at Rotherhithe or the Old Kent Road; and if the supply from any of these works should be interfered with, the gas made at Vauxhall or Bankside could reach New Cross.

The managers of the gas undertakings are not unmindful of their duties and responsibilities to the public; and I think I can claim for them that those duties have been honourably fulfilled, and those responsibilities met, in a proper and satisfactory manner. The public need cheap gas; and this the companies do their best to supply. It is very doubtful whether the consumers would be as well served if the supply of gas were in the hands of the Municipality, whose main object would be to charge as high a price as possible in order to get a large sum annually, out of the consumers, in aid of the rates—that is, the consumers of gas would pay more than their share of the rates. They would pay these directly, in the first instance; and then they would pay again indirectly in a higher price of gas than they ought to be charged. So far, however, as it is possible to forecast, there is no probability of the London Companies being extinguished; but there is a reasonable probability of a long and successful future. I hail, therefore, with satisfaction and pleasure, the course of lectures to be inaugurated to-night. The manufacture of gas involves so many interesting engineering and chemical operations, which, illustrated and explained as they will be by the able lecturers of this Institution, will not only prove a great advantage to all those who are engaged, or who hope to be engaged, in the business, but will also be a source of information and pleasure to the users of gas and to all who are interested in industrial progress.

Mr. LINEHAM said they could not allow Mr. Livesey to leave them without heartily thanking him for his instructive address. It seemed to him that there was something more in it than appeared on the surface; and it would well repay thinking over. He agreed with Mr. Livesey's remarks regarding the control of gas-works by municipalities. His (the speaker's) native town in Yorkshire was supplied with gas by a Corporation; and certainly there had been trouble ever since they undertook the work. It was astonishing that in a large town like Leeds the consumers had to pay as much for their gas as they did in the south of London—2s. 4d. per 1000 cubic feet—although the cost of coal there was less than it was in London.

Mr. BLOXAM seconded the motion; and the CHAIRMAN supported it—remarking that the fact that an address of this character had been so greatly appreciated was evidence of the advantages of an Institute such as that in which they were assembled.

The motion having been cordially passed,

Mr. LIVESEY, in responding, observed that the question of the supply of gas of London or of any of the large cities and towns was one of great importance, and well worthy the attention of all. Gas was not played out, nor was it going to be. One thing that had struck him very much in preparing the address was the very long time that elapsed between the discovery of gas and its practical application. Only very recently it had taken a fresh start; and its greater application now was truly marvellous. Until lately very few of the working class had used gas; but Mr. Brownhill, of Birmingham, a few years ago, conceived the idea of applying the principle of the penny-in-the-slot machines to the supply of gas. The system had since been taken up to an almost astonishing extent. In the case of the South Metropolitan Gas Company, they were now receiving nearly 500 orders a week for these meters from new consumers—at any rate, 450; and in about two years, 20,000 consumers had been connected with their mains, and supplied on this system. In the comparatively small town of Tunbridge Wells, too, where the Gas Company had previously about 2400 ordinary consumers, they had in one year increased the number by nearly 50 per cent., or, in other words, they had obtained 1000 new consumers. This showed that gas was required by the poorer class of people, and that, when it was placed within their reach, they appreciated it. In conclusion, he intimated that, if the gentlemen who were responsible for this course of lectures, would like to take the students to one of the stations of the South Metropolitan Company, every facility should be afforded them for inspecting the plant.

Dr. Dallinger's services as Chairman were also suitably acknowledged before the audience separated.

PARIS STREET-LAMP COLUMNS.

The accompanying illustrations show two types of lamp columns now much in use in Paris streets. Fig. 1 was designed for streets where the foot pavement is fairly wide; while fig. 2 is intended for the lighting of streets with narrow idewalks,

FIG. 1.

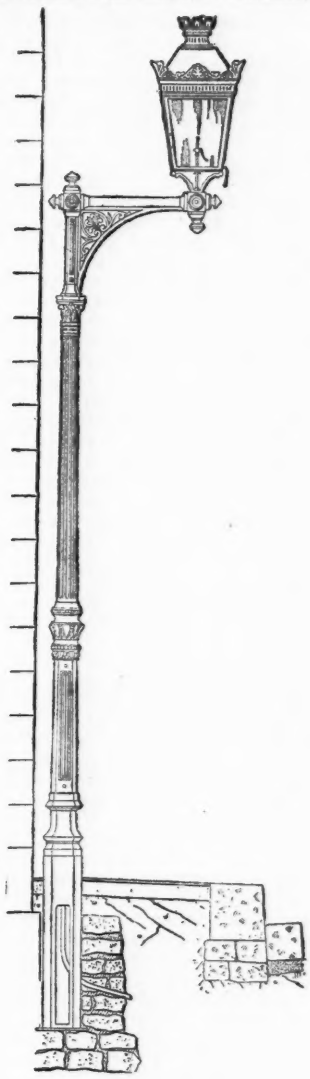


FIG. 2.

and where otherwise bracket lamps attached to the fronts of houses, &c., would have to be employed. An essay—entitled "The Design of Lamp-Columns"—appears to-day, p. 643, and sufficiently describes the engravings.

Water Supplies and Death Rates.—Among the papers read before the Chemistry Section at the recent meeting of the American Association for the Advancement of Science, was one upon observations regarding certain European water supplies, by Mr. William P. Mason. It was shown that the difference in the death-rate of various towns and cities in Europe, caused by improvement in the local water supplies, varied from 2 to 13 per cent.

The Cost of Supplying Gas and Electric Light.—The Industrial Society of Mulhouse are offering a medal of honour for a treatise on the comparative cost of a central electric lighting station and a gas-works, both intended for supplying light to a district containing 30,000 inhabitants. The following points are to be specially treated: (1) Cost of first establishment; laying conductors and mains, and providing necessary fittings both for electric and gas lighting in houses. (2) Outlay for coal for producing electric energy and gas respectively. (3) Cost of working and maintaining the two plants. The papers are to be sent in to the President of the Society by Feb. 15, 1895.

DRILLING FOR OIL AND GAS NEAR PHILADELPHIA.

In a paper read by Professor OSCAR C. S. CARTER before the Chemical Section of the Franklin Institute, he gave an account of some operations which have been carried on in the vicinity of Philadelphia with the view of obtaining oil and natural gas. The following are some extracts therefrom.

There have been several attempts made recently to drill for oil and natural gas near Philadelphia, notwithstanding warnings of failure from scientific experts. There seems to be a kind of fascination and an air of mystery in searching for gold, silver, oil, or natural gas, which, apart from their value, lead men to spend much money and time in prospecting localities which have never yielded anything in the past, and, from a geological standpoint, will never yield anything valuable in the future. True it is, beyond all doubt, that oil has been found in the older as well as in the newer rocks; and nearly every geological horizon, from the silurian up to and including the tertiary, has yielded oil. It is not, however, evenly distributed through all formations. The silurian, devonian, and tertiary rocks have given most of the oil of the world. It was formerly thought that the devonian rocks were the oldest that would yield oil; but when gas was discovered in the Findlay field and oil in the Lima belt in Ohio, in 1886, it brought the limit of the oil-bearing rocks down into the lower silurian formation. The oil of the Lima belt was found in the Trenton limestone, not very far distant, in a geological sense, from the archæan granite. This was a great surprise to many who did not expect oil would be found in such a low horizon near the bed rock of the continent. The Trenton limestone of Ohio is now regarded as one of the most important sources of oil and natural gas in the world.

In Indiana, in July, 1886, the combined flow of all the wells from actual testing and estimates was found to be 500 million cubic feet of gas per day. Many of the gas wells have averaged a million cubic feet per day. The Karg well is the largest in the Findlay district; and it is estimated that 1500 million cubic feet of gas from this well escaped utilization, and were entirely wasted. In many small towns, upwards of 700,000 cubic feet of gas per day were wasted in working up booms and furthering real estate schemes. Laws have been framed for every conceivable purpose, and the rights of man are zealously guarded; but nothing has been done to prevent the criminal waste of Nature's richest gifts, which, in a few years, will exist only in history. The oil of the Trenton field is equally abundant. Many of the wells have yielded 1000 barrels per day; and the product of the Lima belt for 1888 was 9,682,683 barrels of oil. The Lima oil is black and heavy, and contains sulphur compounds which have a disagreeable odour, and are removed with difficulty in the refining process. Particular mention has been made of this Trenton limestone, because the silurian limestone, of which the Trenton is a part, is found near Philadelphia.

The Schuylkill or Chester Valley is an immense trough of jointed, fissured, and steeply dipping limestone. If oil or gas ever existed there, it escaped ages ago. The limestone of Ohio, on the contrary, is as level as a floor; the slope being but 2 or 3 feet to the mile. It must also be remembered that oil at Lima is found at a depth of 1300 feet. It takes 60 days to drill a well; while the silurian limestone near Philadelphia is found on the surface outcropping along the Schuylkill at angles of from 45° to 60° for a distance of four miles below Norristown. Ever since Trenton oil has been found, the sound of the drill has been heard in every State from New England to the Rocky Mountains, searching for this new oil and gas rock of Ohio. It is easily reached in many States, but does not contain oil, because the conditions are not the same. The Trenton limestone is only productive in the part which is a dolomite or magnesian limestone; the non-magnesian limestone has not yielded oil. Besides being horizontal and porous, it must be favourably situated to the surrounding strata for the accumulation of oil.

One of the most interesting experimental wells for natural gas or oil was drilled at Fitzwatertown, 12 miles from Philadelphia. There were stories told in the past, by the farmers of the neighbourhood, of a slight scum of oil appearing on the water in the spring houses, and that bubbles of gas would come up through the water of the creeks, so that some were not at all surprised when drilling operations were begun. Fitzwatertown is a country village on the Limestone Pike. The drilling was commenced by a stock company, and hundreds of acres were leased. The sinking of the well began on an 8-acre farm. I visited the well on May 24, 1890. Three men were at work with a regular oil well derrick and apparatus, and a small engine of 15-horse power. In drilling, they reached water or quicksand at a depth of 10 feet; then limestone was reached. The strata here are nearly vertical, and considerable trouble was experienced as pieces broke off and fell down the well. There was much difficulty in keeping the drill-hole straight. It is much easier to drill horizontal strata. The drill passed through 330 feet of silurian limestone before the so-called Potsdam sandstone was struck. The well was then probably about 460 feet deep. An examination of the drillings showed me that the drill was then passing through the so-called Potsdam sandstone, which has never yielded oil or gas in any locality. About 130 feet of Potsdam had been drilled. The well was cased with iron pipe to a depth of 330 feet, or through the limestone. It is a wet well; the water rises to within 10 feet of the surface. The sand-pump was put down that afternoon, and the well cleaned and a new drill put on; but not the slightest odour or indication of gas could be observed at the mouth of the well. The most interesting feature about the place was a pond of clear and sparkling water about 12 feet distant from the derrick; the sand or quicksand in the bottom was in continual motion. One of the workmen procured a pole, and on pushing it down through the sand, bubbles of gas came up by the hundred. There was a small gas-holder of 10 gallons capacity floating in the pond, and furnished with a stopcock. On turning this, I noticed an odour of gas; and, on lighting it, found it burned with an almost invisible flame. It may have been marsh gas. No analysis was ever made. There seemed to be no decomposing vegetable matter in the pond. The drillers were very sick of their work. After they had drilled 550 feet, they left; but the contract stipulated that they were to drill 720 feet before stopping. If they ceased before that depth was reached, then the company were to have the use of the plant one day for each foot that remained to be drilled. The plant was finally sold at a sheriff's sale, although the company were entitled to the use of it for 170 days. Nothing further was done; and the well was abandoned.

Not long after the failure of the well at Fitzwatertown, a deep well was drilled for oil and gas in Bucks County, not far from Philadelphia, in the new red sandstone of triassic age. This well was more than 1000 feet deep; and it passed through beds of sandstone, red shale, and slates. A bed of black slate, containing coaly matter, was encountered. This is the same bed of slate that was met with in drilling all the artesian wells at Lansdale, Montgomery County (Pa.), in the new red sandstone. The same bed of coaly slate was passed through in drilling the Duffield well several miles distant, on the Stony Creek Railroad. Another experimental well for oil and gas was drilled at Valley Forge, in the Potsdam sandstone, with the usual result.

Not long afterwards, there was reported a find of crude petroleum near Doylestown, Bucks County. It was announced that what seemed to be a rich crude oil was oozing out of the ground on the small farm of one William Eisenhart. While Mr. Eisenhart was working in his cornfield, he came upon a pool of water covered with a heavy scum of oily substance. He found that a stream of oily fluid was oozing out of the ground and covering considerable space; finally finding its way to Cook's Run—a small stream running near by. Several citizens from Doylestown visited the place of the supposed rich discovery, and were outspoken in their belief that oil existed in paying quantities at no great distance below the surface. Mr. Eisenhart sent me a sample of this water for analysis. Qualitative tests showed much iron and organic matter, and a black substance held in suspension; but not the slightest trace of oil was present.

American Gaslight Association.—The twenty-second annual meeting of this Association is to be held at Washington (D.C.), from the 17th to the 19th inst., under the presidency of Mr. W. H. Pearson, of Toronto. The list of papers has not yet been published; but it is understood that a good supply of technical matter will be presented to the members for discussion; and the "Question-box" will doubtless, as hitherto, be the medium for the conveyance of information on matters of interest. We learn from the *American Gaslight Journal* that Mr. F. Egner will discourse on various methods of making water gas from bituminous coal; and Mr. Walton Clark, the Vice-President, will deal with the subject of the public ownership of gas properties.

The Iron Industry of European Russia.—One of the officials at the British Embassy at St. Petersburg (Mr. O'Beirne) has made an exhaustive report on the iron industry of Russia. He says there are six chief iron-producing regions in European Russia—the Urals, South and South-Western Russia, South Poland, Sub-Moscow, North Russia, and South Finland. Of these, the Urals range is by far the most important; providing two-fifths of the pig iron produced in the Empire. It is also rich in magnetic and brown iron ores, and contains deposits of hematite, specular, and chrome iron, and manganese ore. The deposits, some 2000 in number, of brown iron ore are inexhaustible; many, indeed, are not worked. Of manganese iron, 270,000 tons were smelted in this district in 1891. The distinguishing feature of the Urals iron industry is the extensive use of wood fuel; blast-furnaces being fed almost exclusively on charcoal. During the year 1891, only 36,000 tons of coal and coke were consumed. In Russia, it requires five times as many blast-furnaces burning wood to produce the same quantity of cast iron as are necessary where coal is used. The future expansion of the Urals iron industry is, therefore, largely dependent on the extent to which it may be found possible to replace wood fuel with coal found locally. Difficulties of communication between the iron deposits and the works, and between the latter and the markets, have greatly impeded the development of the industry. North Russia draws from abroad most of the pig iron it requires—five-sixths from Great Britain, which also supplies it with a large quantity of cast iron, wrought iron, and steel. The total production of pig iron in Russia in 1881 was 28½ million pouds (36 lbs.); in 1892 it had increased to 66 million pouds. The production of wrought iron in the same years was 18 and 30 million pouds respectively; and the quantity of steel turned out was exactly the same as that of wrought iron, both in 1881 and 1892.

REGISTER OF PATENTS.

Water-Meters.—Collins, B. A., of Lavender Hill, Wandsworth. No. 13,943; July 18, 1893.

In this invention, relating to water-meters, the patentee proposes to employ a vertical and shallow cylinder, provided with a suitable inlet and outlet arranged upon opposite sides, and closed at its ends. Within the cylinder is arranged, upon a vertical axis, a drum of smaller diameter than the cylinder; while around the periphery of this drum there are mounted upon axes of motion at suitable intervals, and equidistant from each other, a number of curved vanes or blades, which, when open, extend to the periphery of the cylinder, and make an approximately tight joint therewith. The drum also has recesses corresponding with the curved vanes or blades, so that they may, when desired, lie flush with the periphery of the drum.

The space between the cylinder and drum, for a distance of about half the circumference thereof—that is, from one side of the inlet to the corresponding side of the outlet—is filled in, so as to compel the current to act upon the blades or vanes upon one side only of the axis of the drum; and an approximately tight joint is made between the periphery of the drum and the "filling," by carefully fitting. In order to close the vanes into their recesses while passing the "filling," the end of the "filling" adjacent to the outlet is made inclined, so that it will act upon the vanes in succession as they arrive at that point, and close them into their recesses. The outlet is also made slightly smaller than the inlet, so that, under water, it forms a back pressure of water in the meter, and so cushions the vanes in closing without any apparent noise.

In order to open the blades after passing the "filling," and in readiness to be acted upon by the water flowing in at the inlet, a cam pin is made to act upon tails or lever arms, which extend behind the hinge or pivot of the swivelled vanes or blades immediately they have passed the "filling," so as to raise them into position to be acted upon by the current of the water. The shaft or spindle of the drum is fitted with a cup leather to prevent any water rising; and it passes through stuffing-boxes carried by the ends of the cylinder, and is connected with any suitable counter for recording the number of revolutions.

As the drum is dependent for its rotation upon the force of the current of water, it might sometimes happen that the current was not sufficiently powerful to turn the drum, and there might be (notwithstanding careful fitting) a leakage of water past the blades without anything being recorded. But, in order to obviate this defect, the following device is arranged for: The outlet from the water-meter is connected with an inlet, arranged at the upper part of a suitable tank or cistern, provided with an outlet at the lower part. Within this tank is arranged a funnel-shaped vessel of small capacity; and within this latter vessel, is a ball or float, connected, by means of a vertical spindle, with one end of a horizontal lever, the other end of which is attached to a cock controlling the inlet to the tank, and consequently the outlet from the meter. At the bottom of the funnel-shaped vessel is an outlet, controlled by a cock connected, by an arm or lever, with a ball or float within the tank, and which, when in its lowermost position, opens the cock, and in its upper position closes it. By this arrangement, when the tank is emptied—that is, in the normal position of the parts—the outlet from the funnel-shaped vessel is opened by the descent of its connected ball or float, while the cock controlling the inlet is opened by the descent of the ball or float within the funnel-shaped vessel. Water will now flow into the tank; and, upon rising a short distance in it, the lower ball or float will be raised, and close the cock at the bottom of the funnel-shaped vessel. The water will continue to ascend until it reaches the top edge of the vessel, when it will suddenly flow into it, causing the contained float or ball to instantaneously rise and close the cock controlling the inlet to the tank. The water within the cistern will now pass away by the outlet, as it is drawn off by the consumer; but, inasmuch as the lower ball will be supported by the water until it falls below the level of the outlet, the water within the funnel-shaped vessel cannot escape, but will hold the ball or float therein in its raised position, and the inlet cock closed, until the level of the water falls to about the level of the outlet. The cock closing the lower end of the funnel-shaped vessel will then be opened; and the water will be discharged therefrom, and permit the float to fall, and the inlet-cock to the tank to be opened.

Diffusion and Distribution of Light.—Psaroudaki, S., and Blondel, A., of Paris. No. 19,185; Oct. 12, 1893.

This invention has for its object to replace the present form of globes, shades, and reflectors by others made of transparent or crystal glass, for which the patentees claim the following results: (1) They are shining on almost the whole of their visible surface; receiving, for this cause, the name of "holophane" (entirely shining). (2) At the same time as they diffuse, they distribute the light vertically and horizontally, "according to a required law that seems best in each case of use, whatever may be the source of light." (3) They avoid the loss of light caused by the bars or flutings.

These three results are said to be obtained by means of moulded transparent or crystal glass substitutes, bearing vertical meridian flutings on the inner surface and horizontal parallel flutings on the outer surface. The external flutings are intended to simultaneously distribute and diffuse the light in the vertical direction. They are very small dioptrical, catadioptrical, or mixed (both combined) rings, about 5 to 10 millimetres wide, the profiles of which are not parts of one general distributing profile only, but are independent of each other. Each profile is calculated separately, according to the law of optics, for distributing its own light within the largest possible vertical angle; and there precisely according to the law of distribution required for the whole of the light. Hence it follows, say the patentees, that almost all the flutings seem simultaneously brilliant; and that the distribution of light is nearly independent of the source of light placed in the envelope.

Regenerative Gas-Lamps.—Fisher, W. E., of Willesden Green, London. No. 19,447; Oct. 16, 1893.

The patentee remarks that hitherto the coating employed in regenerative gas-lamps has been made in parts, afterwards attached together; and in order to secure sound joints, an asbestos or some other kind of washer has been used as a seating for the respective parts. According to his invention, the whole of the regenerator, flange-ring, and burner-nozzle are cast in one piece, so that there is no possibility of the air finding its way to the flame in any other than the desired direction. Moreover, in such a lamp when it is first lighted the flame becomes steady and bright almost instantly—avoiding the flickering and smell which takes place in some regenerative gas-lamps.

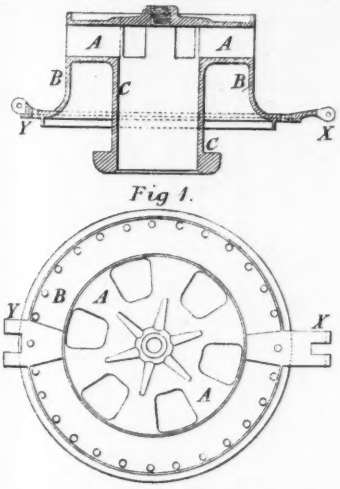


Fig. 1.

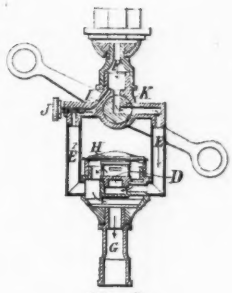


Fig. 2.

Fig. 1 is a vertical section and a plan of a casting in one piece of the regenerator, flange-ring, and burner-nozzle, A B C. The other parts of the lamp are of any suitable kind, connected with the casting in the usual way. The hinge-lug Y and lug X for the fastening lever are here shown as cast with the parts, although they may be otherwise attached if desired.

Fig. 2 shows the arrangement for affording access to the regulator without detaching the lamp. D is the regulator, mounted between the arms E E^2, constituting passages from the gas-pipe F, for supplying the main flame and the small pilot flame respectively. H is a cover for the regulator, tightly secured in place, so that it can be removed without otherwise interfering with the lamp. I is the bye-pass for gas to supply the pilot flame; and J is the regulating screw for it. K is the cock by means of which the supply of gas to the main flame is opened, cut off, and adjusted. The part of the pipe G shown is a lengthening piece, to which the lamp proper is secured, and which is dispensed with when the lamp is to be used at a higher level.

Gas-Stoking Tool.—Ennis, T. F., of Nine Elms, and Waller, B. B., of Park Street, Southwark. No. 20,303; Oct. 27, 1893.

This invention has for its object "the attainment of greater facility in charging gas-retorts than heretofore," by the employment of a "horse" (of steel or other suitable metal) consisting of a straight rod, 4 feet long or thereabouts, with or without a handle at each end. On each side of the middle of the rod, and at about 2½ inches from it, is placed a small roller, the edges of which are preferably bevelled, and which is free to revolve on the rod; the rollers being kept in position on the rod by collars or other suitable means. The horse "is held under the filled scoop by the stokers in the usual manner; and the scoop is run into the retort on the rollers—thus minimizing the friction incident to the use of the old form of horse."

Gas-Burner.—Rose, A., of Birmingham. No. 21,804; Nov. 15, 1893.

This gas-burner consists of a short metal tube, by preference made slightly taper, and of a size to fit tightly upon, and cover the upper part of, a Bray or other gas-burner. At a short distance below the nipple, an indented ring or groove is made round the outside of the tube, forming a corresponding projecting bead or ring round the inside; and between this ring and the bottom of the nipple, and resting on the bead, is a piece of fine muslin or wire gauze or other suitable substance, "through which the gas will pass, and by which the gas is broken up and reduced in pressure." The patentee claims for this "invention," that the gas "is caused to expand, and is reduced in pressure, before it issues through the nipple; and therefore a better light is obtained, as the whole, or nearly the whole of the gas issuing through the nipple is consumed."

Manufacture of Water Gas.—Westcott, J. T., of Cramer Hill, New Jersey, U.S.A. No. 11,657; June 15, 1894.

This invention is applicable to all water-gas apparatus having the generator and superheater fixing-chamber or carburetter in separate shells; but it is more particularly designed in connection with the apparatus described in patent No. 8371 of 1893.

The present apparatus comprises a generator having a steam supply at both top and bottom, with a superheater or fixing chamber and a passage-way or flue (or more than one such passage-way) to conduct the gases to the superheater. This passage-way is connected with the upper and lower parts respectively of the generator by separate passage-ways or flues—each fitted with a valve. The two valves are provided with mechanism for opening and closing them; and preferably they are connected together, and the mechanism is so arranged that they are operated simultaneously—the one being open while the other is shut. The invention includes special mechanism for this purpose, and the use of a weight, which with the weight of one valve counterbalances the weight of the other. The valves are cooled by their boxes being made hollow, and supplied with water; and in connection with each valve is a bonnet, into which it is drawn when raised—its lower end being then opposite the hollow water-filled

walls in the top of the box. A washer connected with the outlet-pipe of the superheater is cooled by the water that supplies the valve-boxes. The superheater may consist of two independent superheating or fixing-chambers, one located directly above the other, and communicating with each other; and there may be an intermediate chamber, between the generator and the superheater (with one or more air-blast passages), and a similar chamber at the bottom of the lower chamber of the superheater.

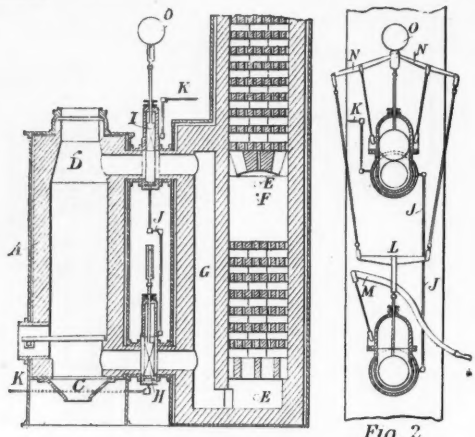


Fig. 1.

Fig. 2.

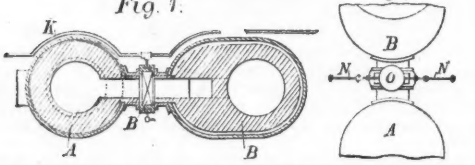


Fig. 1 is a sectional elevation of the apparatus—only so much of the superheater being given as is necessary to show the invention. Also a sectional view of the plant, showing the pipe leading to a washer. Fig. 2 is a vertical section looking towards the superheater; and a plan of the apparatus. A is the generator; and B the superheater or fixing chamber. The former is provided with the usual appliances for supplying air and coal, and with a steam-pipe C (below the body of the fuel) for sending steam upwardly through the same, and a steam-pipe D above the body of the fire for sending steam downward through the fuel. The superheater or fixing chamber has the air-blast pipes E, oil-pipe F, and passage-way or flue G, with an opening to connect it with the bottom of the superheater or fixing chamber. The upper part of the flue is connected by a passage-way or flue with the upper part of the generator; and the lower part, with the lower part of the generator, by another passage-way or flue. Each passage-way is provided with a valve, to be opened and closed at pleasure. When the lower valve H is closed, water gas is made by passing steam through C, and upwardly through the fire and to the superheater through the corresponding passage-ways. When the upper valve I is closed, steam is admitted to the upper part of the generator through D, and passes down through the fire and to the superheater by the corresponding passage-ways.

In passing the water gas from the generator to the superheater, it is desirable to have the cross flues as short as possible, so that loss from radiation will be reduced to the minimum; and to reduce these flues to the shortest length, the valves H I are made of the minimum distance from face to face. The faces of the valve are inclined from the top, bottom, and sides towards the centre—forming a double-faced, combined, wedge-shaped valve, having the thinnest part in the middle. To insure the valve against the intense heat of the flues, the valve-boxes are made with hollow walls, forming a space through which cold water is constantly passed to keep the walls of the boxes cool. The valves, while in these boxes, are kept cool by the cold inner walls of the boxes; this effect being more readily accomplished by the formation of the valve, which is gradually decreased in thickness from the edges to the centre. Thus, as the distance from the edges increases, the amount of metal to be kept cool is decreased. Each valve-box is provided with a bonnet, into which its valve is drawn when a flue is to be opened for the passage of the water gas. The bonnet is of sufficient height to permit of the entire valve being withdrawn from the passage-way or flue, so that the lower edge will be the only part subjected to the heat of the gas; and that part will be cooled by the upper part of the water-box, and kept from expansion by reason of the heat.

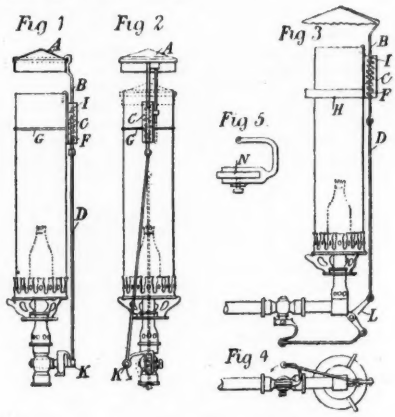
The advantages of such a construction are that, (1) instead of being loose fitting, to allow for expansion and contraction, the valves can be made to fit close, and thereby prevent any leakage; (2) they are also kept from expansion, and thereby prevent cramping of the valves in the box, as would be the case if no protective means were used; and (3) they can also be easily moved in their boxes—a feature that is very important, when it is desired to reverse the flow of steam or water gas through the generator. The water-boxes are supplied with water from any source, and are preferably connected together by a pipe J leading from one box to the other. The supply is furnished, when so joined, by a pipe K leading to the washer connected with the outlet-pipe of the superheater, which is thereby supplied with warm or hot water; thus preventing the escaping gases from the superheater or fixing chamber from being subjected to cold water in the washer, and thereby insuring great oil or liquid hydrocarbon economy.

Another feature of the use of the water-cooled valves is the ease with which the valves can be opened and closed when it is desired to make up or down runs. During a single heat, the steam may be sent up and down through the generator as many times as desired—thereby producing great economy in fuel, and avoiding the formation of clinkers and dead coal or a steam-condensing mass on the grate-bar, as is the case when steam is run in only in one direction. The operator gauging the fire can determine whether the bulk of the gas shall be made by the up or down run. To ensure the proper opening and closing of the valves, and to avoid all danger of accident by reason of carelessness or inattention on the part of the operator, the valves H I are so connected together that when one is open the other is closed. The operator can thus change the direction for the gas to flow with ease and certainty. The preferred means of connecting the valves is a system of levers and links uniting the stems of the valves. In the arrangement shown, the stem of the lower valve H carries upon its upper end a tie-piece L, to the vertical part of which is pivoted an operating lever M having its outer end fulcrumed upon the upper end of a link, pivoted at its lower end to some fixed point, preferably the valve-box. This link fulcrum permits of the valve being raised and lowered without any strain upon the valve-stem. Pivoted to the outer ends of a cross-piece, are links projecting upwardly and outwardly from each other, and connected at their upper ends by levers N, each fulcrumed upon the upper end of a link, preferably pivoted at its lower end upon the upper valve-box. The inner ends of these levers are pivoted to a cross-head fixed to the upper end of the stem of the upper valve I, and carrying a counterweight O, of such a size that it requires a certain power applied to the operating lever M to move it in either direction.

When it is desired to blow-up a heat, the lower valve is closed by lowering the handle of the lever, which opens the upper valve, and allows the heat to pass through the upper flue to the superheater. The same arrangement of valves is made when steam is admitted below the grate of the generator for an up-run; but when the steam is admitted through the pipe D for a down-run, the lower valve is opened by elevating the handle of the lever. This movement will also close the upper valve; thus forcing the steam down through the incandescent fuel in the generator and out by the lower passage-way.

Dust-Protector for Incandescent Gas-Lamps.—Berlin, N., of Cologne. No. 14,111; July 23, 1894.

Up to the present time, says the patentee, incandescent gas-lamps have suffered from the disadvantage of the "stockings" being dirtied by the dust that fell down on them from above; and it has been proved that the illuminating power suffers to such a degree from the effects of the dust, that it is sometimes diminished by 50 per cent. It is in order to do away with this disadvantage that the inventor has designed the apparatus which may be attached to every incandescent gas-lamp, and, on the gas-cock being turned on or off, automatically effects the closing or opening of the chimney.



The arrangement as shown in figs. 1 and 2 is for incandescent burners with ordinary cocks; while that in figs. 3 and 4 is for those with elbow-cocks. Fig. 5 shows a detail of the latter arrangement.

The apparatus consists principally of a chimney-cover A made of metal, glass, &c., which (as in figs. 1 and 2) either has a rim projecting beyond the chimney, or (as in figs. 2 and 4) is without any rim. The cover is attached to a rod B, having at the bottom an eyelet for the reception of the draw-rod D, and passing loosely through the cylindrical case C, which is secured to the chimney of the lamp, either by a wire G (figs. 1 and 2) or a spring holdfast H (fig. 3). In this cylindrical case is a spiral spring F, which with its one end rests against the bottom of the case, and with the other against a clamp I attached to the rod B. The rod D is either directly secured by means of a joint K to the key of the gas-cock, as in figs. 1 and 2, or (especially in the case of elbow-burners being used, where the cock is not below, but at the side of, the burner) this joint is effected by means of an angle-lever L attached to the knee of the burner, and the middle-piece N (fig. 5) secured to the key of the cock and the draw-rod M.

Incombustible Burners for Gaseous Fuel.—Westphal, C., of Berlin. No. 14,436; July 27, 1894.

Incandescent gas-burners, according to this invention, are made of compounds of calcium, aluminium, magnesium, strontium, silicon, and barium—such as carbonate or silicate of lime, fluoride of calcium, chalk, clay, kaolin, talc, sand, quartz, pumice-stone, soap-stone, carbonate and sulphate of strontium, and the like—each substance separately or in combination with one another. To this principal substance or basis, are added compounds of the heavy metals—such as oxide of zinc, oxide of lead, ceruse, peroxide of iron, oxide of manganese, oxide of tin, or the like. This mixture is moistened with a solution of water-glass, alum, boric acid, or the like. It is then moulded and, if necessary, burned.

The addition of compounds of the heavy metals to the principal

substance has for its object to give the burners the necessary resistance, and in order that the burner shall not crack or change its shape during the burning or drying process.

To give the burners the necessary porosity for certain purposes, there are added to the mixture such bodies as are completely or partially volatilized by heat. For special purposes, pulverized sulphur is added, which is partially volatilized by the heat, and partially chemically combined with the substance.

The burners thus obtain a vitreous structure, which is especially necessary for burners exposed to humidity when not in use—as, for instance, in street-lamps, or for those intended for exportation.

APPLICATIONS FOR LETTERS PATENT.

17,167.—SANDERS, G. F., "Pendants or suspenders for gas, oil, or other lamps." Sept. 10.

17,176.—KRANER, E. R., "Flat glass chimney for incandescent gas-light." Sept. 10.

17,193.—SHARP, J. H., "Frame for shade for gas-lights." Sept. 10.

17,395.—PETTIGREW, G., "Gas-washer." Sept. 13.

17,431.—WADSWORTH, G. P., "Coin-freed gas-meters." Sept. 13.

17,448.—POORE, P. R., "Stoves for gas, oil, or other suitable fuel. Sept. 13.

17,455.—GARDNER, H., "Improved means and apparatus for charging gas purifiers with lime or other purifying agent from the cover-lifting machine or overhead traveller." A communication from F. D. Marshall. Sept. 13.

17,458.—EWINS, J. A., "Self starter for gas or oil engines." Sept. 14.

17,526.—JACQUIN, L. E., "A heater for utilizing the waste or excess heat from apparatus for heating by means of gas or oil." Sept. 14.

17,555.—DINSMORE, J. H. R., "Improvements in or connected with apparatus for making gas from coal." Sept. 15.

17,586.—HUNTER, W. A., "Apparatus for lighting and extinguishing street and other gas-lamps." Sept. 15.

17,604.—GOODWIN, T., "Universal jet for the conveyance of light and heat and prevention of explosions in the use of same." Sept. 17.

17,617.—HUTTON, W. R., "Distillation of coal, lignite, and dross." Sept. 17.

17,623.—JOHNSTON, J., "Self-generating oil-gas burners and furnaces applicable for lighting and heating purposes." Sept. 17.

17,679.—BREMME, F., "Carburation of gases." Sept. 17.

17,693.—SCOTT, J. W., "Extracting the solid and gaseous impurities from illuminating and other gases." Sept. 18.

17,706.—HAWKYARD, J., and BRADDOCK, J., "Supplying gas or other fluid on prepayment." Sept. 18.

17,743.—SIMONET, V., "Vapour burners." Sept. 18.

17,757.—MILSTED, W. N., "Prepayment gas-meters." Sept. 18.

17,765.—TANGYES LIMITED and LESTER, A. J., "Gas-engines." Sept. 18.

17,780.—BOULT, A. J., "Water-meters." A communication from Th. Derichs and Messrs. Hegenscheidt Bros. Sept. 18.

17,801.—GELL, R., "Conveyance-shoot for pennies, for use in coin-freed automatic machines." Sept. 19.

17,873.—BLAKE, H. T., "Dowson gas enricher." Sept. 20.

17,886.—WILLIAMS, R. C., "Gas-meters." Sept. 20.

17,987.—WILLIAMS, S. DE LA G., "Production of gaseous fuel." Sept. 21.

18,047.—DEMPSTER, J., "Gasholders." Sept. 22.

18,049.—GIBB, D. M'C., "Atmospheric gas-burners." Sept. 22.

18,078.—DVORKOVITZ, P., "Enriching gases by liquid hydrocarbons." Sept. 22.

The Proposed Adoption of Electric Lighting at Winchester.—A petition, signed by 650 ratepayers and inhabitants of Winchester, has been presented to the Town Council against their proposal to undertake an installation of the electric light. Notwithstanding this, they have confirmed their previous resolution, empowering the Town Clerk to apply for a Provisional Order—only, however, by a very close division; eleven members declaring in favour of the confirmation, and ten in opposition to it.

The Charges for Electricity at Huddersfield.—It appears that the demand for electricity in the borough has not yet reached the expectations of the Huddersfield Corporation; and, at their last meeting, they had under consideration the question of making some concessions in the charges, with the view of stimulating the consumption and attracting new customers. The Electric Lighting Committee submitted a report in which they recommended that discounts should be allowed starting at 2½ per cent. on a consumption of 1000 units in the half year, and rising, by ½ per cent. for every additional 200 units, to 10 per cent. for 4000 units and over. In addition, they suggested that, if the consumption per half year per 8-candle power lamp (or equivalent) fixed upon the consumer's premises should be above 15 Board of Trade units, a discount of 10 per cent. should be granted; between 10 and 15 units, 7½ per cent.; between 8 and 10 units, 5 per cent.; between 6 and 8 units, 2½ per cent. It was further decided that a revised scale of charges for meter-rents should be adopted; and that the supply of electrical energy for motive and domestic purposes other than lighting should be at the rate of 4d. per unit. The adoption of the minutes containing these recommendations was moved by Mr. Calvert, who mentioned that beyond the discounts on the graduated scale for consumption, 5 per cent. would be allowed for the cash payment of accounts, and that the reduction in meter-rents was about 50 per cent. all round. Alderman Crosland inquired whether the electric lighting undertaking was likely to be a paying one, because if it was going to be a charge on the rates, he did not believe in the reductions. The Mayor (Alderman J. J. Brook) replied that the idea of the Committee was that the reductions would lead to a considerably increased income. Alderman Calvert added that the Committee had not a sufficient demand for the excess of electricity they could generate; and the Sub-Committee were appointed to find some way out of the difficulty, so as to increase the consumption. The minutes were passed.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

High v. Low Grade Mineral Oil.

SIR,—Will you permit me to reply to the leading article in your issue of Sept. 4, entitled "Petroleum or Gas for the People"? Having been from home, I have only just seen the article.

On the question of the relative values of electricity, gas, and oil, I do not offer any opinion. They are all used in every civilized country, and will continue to be used in increasing quantities. My purpose is to deal with your strictures on the controversy which has arisen regarding the quality of petroleum imported into this country, and its responsibility for the numerous lamp accidents which occur, and also for the threatened interference by Parliament with the oil industry. It is true that Scotch oil refiners believe that low-flashing oils are responsible for *every* explosion which occurs in a lamp, and for the major number of the accidents from other causes. They are of opinion that but for these accidents nothing would be heard of restrictive and harassing legislation. I am not aware of any "jeering" at lamps, or at efforts made to improve them. It is most desirable that the consumer should not only be supplied with a safe oil, but with a well-constructed lamp. A good lamp gives a better light than a flimsy one of German construction; and it is less apt to get out of order and is not so provocative of bad language. But the lamp is a secondary matter as far as safety is concerned. To lay the blame on it is to raise a side issue, designed to draw attention from the main question. If, therefore, the Scotch refiners appear to ignore the theory advanced by the petroleum interest, that it is the lamp and not the oil which is at fault, it is due entirely to this belief. If oil gives off inflammable vapour when burning in a lamp, from that moment there is danger. It may be impossible, under ordinary conditions, for flame to touch the vapour and cause an explosion. But the vapour is there, and the accidental upsetting of the lamp may liberate it; and if the wick is not at the same time extinguished, disaster is inevitable.

That flash-point is an important consideration when dealing with lamp oils, is certain. This is recognized by the Government, from the fact that all oils flashing under 73° Fahr. (Abel close test) are placed under special restrictions. But 73° Fahr. is, for practical purposes, an arbitrary standard. In some respects it might be better to have none. The temperature of oil in lamps is frequently much above 73° Fahr. But of the thousands who burn oil regularly, how many know this, or understand what the words "flash-point" mean? The Government having settled that 73° Fahr. is safe, they are content. Here is the record of an experiment with "Tea Rose" petroleum in a metal fount lamp. Temperature of room, 60° Fahr.; temperature of burner, 141° Fahr.; temperature of oil after burning four hours, 80° Fahr. The flash-point of this oil was 75° Fahr.; and for a considerable portion of the time it was burning, it must have given off inflammable vapours freely. To say that such oil can be safely used is absurd. A barrel of gunpowder might be kept for years in a club smoking-room without exploding; but few would risk the experiment. The danger from low-flash oil when a lamp is burning is ever present; and it merely requires a combination of circumstances to bring about a catastrophe. The true point of safety in the case referred to was a flash-point above 80° Fahr.; but, as the temperature of oil in lamps is sometimes more than this, and to provide a reasonable margin, the minimum flash-point should not be below 100° Fahr.

I do not understand your argument, as stated in the following sentences: "Those who favour this remedy"—*i.e.*, the raising of the flash-point—"jeer at the idea of trying to improve lamps. . . Unfortunately for this contention, it cannot be shown (what should logically follow) that oils with a high flash-point are always and everywhere innocuous." No one has been foolish enough to say anything of the kind. There is danger connected with the use of all oils, just as there is danger in using gas or the electric light. "The human race has not yet reached the level of intelligence when nobody will commit the folly of looking for a gas leak with a naked light." Precisely so. Servant girls light the fire with the assistance of petroleum; and lamps are knocked over on the hearth-rug by stupid or careless people. The word "safe" as applied to petroleum is a relative term, and does not mean that it is always, and under all circumstances, innocuous. What is contended for is that the flash-point should be higher than the temperature of the oil in the lamp, or the temperature of a summer day; and that, under normal conditions, inflammable vapours are not given off, either in the lamp or in the store. Even if an accident occurs with high-grade oil, and a carpet is set on fire, the progress of the flame is slow at first, and time is given to extinguish it. With low-grade oil, heated above its flash-point, there is seldom time to do anything. It flames at once, as a train of gunpowder would do.

I do not attach importance to the special pleading of the writer in *The Times*, and to which you approvingly refer. In his opinion, "the whole affair is a desire to obtain protection, at the expense of the general consumer, for the Scotch mineral oil trade." It might change the aspect of things if the writer in *The Times* were to reveal his identity. We should then know whether the real motive was not to support the protection at present given to the American producer at the expense of the consumer in England and Ireland. The flash-point of 73° Fahr. was fixed to suit him, and to enable him to make Great Britain the dumping-ground for an article his own Government will not permit him to sell at home. But, of course, "Free Trade England" is more concerned about protecting the foreigner rather than protecting the property and the lives of her own subjects!

There are few cases on record in which accidents have occurred with oil of a high flash-point, against thousands occurring annually in London alone from low-grade oil. There was the catastrophe at Abergele in Wales many years ago, when a number of barrels containing Welsh high-grade oil were smashed by the locomotive of a mail train. The locomotive was overturned in the centre of the *débris*, and the burning ashes set fire to the oil. To argue that a catastrophe of this kind proves that there is practically no difference in safety between high-grade and low-grade oil, is simply an abuse of the art of

reasoning. The case of the *Goliath* training-ship is not more conclusive. A lamp was dropped on a floor saturated with oil; and the wood acting as a wick, set the vessel on fire. The only occurrence on which those who profess to believe that oil of 73° Fahr. is as safe as oil of 100° Fahr. or over, is the accident to Lord Romilly. The peculiarity about this case is that Lord Romilly was using a patent lamp of good construction, with a metal tube down through the oil, which had, and was probably intended to have, the effect of heating the oil to make it flow freely up the wick. The lamp was overturned on the rug, which was set on fire. Lord Romilly had time to go downstairs to call for assistance, and returned to the room; but he was overpowered by the smoke, and perished. These are the cases on which the argument is based that all oils are much alike, and that it does not matter what quality is used. According to a *Times* correspondent (whose letter I have not seen), high-test oil is more dangerous than low-test oil. He used the latter for ten years without an accident, whereas the former caused an explosion within a fortnight. This statement, as put by you, is incredible. No explosion can occur in a lamp where inflammable vapours are not present; and, under ordinary conditions, the temperature is not raised to 100° Fahr.

The question cannot be satisfactorily disposed of by the American or the Scotch producers, or by anyone connected directly or indirectly with either interest. There is too much involved to permit of it being settled by the votes of parties. I am profoundly convinced of the benefits which accrue to a country untrammelled by protective duties and restrictions on industry. I would not, wittingly, interpose a single barrier between the people and the produce of any land. But believing, as I do, that the present standard of safety for lamp oils is illusory, and will, if unchanged, lead to the adoption of measures which will hamper, if they do not destroy, all engaged in the industry, I ask for an unprejudiced hearing for the views held by those who advocate the raising of the flash-point to not less than 100° Fahr. The remedy may appear too easy of accomplishment to be effective; but simple cures are not infrequently the best.

Glasgow, Sept. 26, 1894. JOHN YOUNG.

Combined Gas-Making Systems.

SIR—It appears from what we gather from the columns of the JOURNAL, that we are on the eve of a great change in the manufacture of illuminating gas. We have the Peebles process, and the various processes for the manufacture and enriching of water gas; and now in the JOURNAL for Sept. 25, p. 605, I see another process—a combined coal and water gas system in one bed of retorts. We welcome any and every system that will enable us to manufacture gas cheap enough to compete with our most formidable opponent, especially in small gas-works—petroleum oil; for only those connected with small gas-works have any idea of the many drawbacks to producing and selling gas cheap enough to compete with this oil.

It appears to me that for an enterprising gas engineer or firm of gas engineers who would care to go to the expense of a few experiments on a combination of the processes to be carried on in the same bed of retorts (similar to that mentioned in the JOURNAL), a little fortune is in store. I sincerely hope some one will see his way very soon to enlighten us on this subject, and be prepared with it before we commence our next season's extensions and repairs.

Penmaenmawr, Sept. 26, 1894. ROBERT DEMPSTER.

Reductions in Price.—The Oldham Corporation Gas Committee have resolved to reduce the price of gas 2d. per 1000 cubic feet, which will bring it to the figure at which it stood before the coal strike. During the discussion of the matter, it was stated that the department had a reserve fund of rather more than £34,000. It is expected that a similar reduction will be made by the Todmorden Local Board. The Directors of the Woking District Gas Company, Limited, announce that from the 1st. inst the price of gas will be reduced from 4s. 9d. to 4s. 6d. per 1000 cubic feet.

Coventry Corporation Electric Lighting Works.—The installation of the electric light in Coventry is making rapid progress. Powers to carry out the work were conferred upon the City Council in 1891; and, as may be remembered, application for sanction to borrow £20,000 to defray the cost was made in May last. The contract for the electrical portion of the work was placed with Messrs. John Fowler and Co., Limited; the amount being £9672. The cost of the land (2 acres in extent), including the legal expenses of transfer, was £750; and the expense of trenching and making good the streets is estimated at £300. The contract for the building (which is well in hand) amounts to £6859, exclusive of extras. The dimensions of the main block are 115 ft. by 80 ft. In the engine-room there will be two powerful engines of 200 and 100 horse power respectively; and there is a bed for a third engine similar to the larger one. The engines will drive a 150 unit dynamo; and the motive power will be supplied by two Lancashire boilers, each 30 feet long.

An Unproductive Boring at Otley.—The experience of the Otley Local Board in searching for water, with the view of augmenting the existing supply, has not been the most agreeable. They have been carrying on boring operations for some time, and spent about £1200; but all in vain. No water has been found; and Professor Green, who has been consulted, is of opinion that no large supply is likely to be met with in the borehole at a depth of less than 950 feet, and it may be necessary to go even deeper than this before any considerable amount is obtained. To continue driving the borehole to this extent would mean, it is reckoned, a further expenditure of £2000 or £3000; and it is a serious question for the Board to consider whether they are justified in spending so large a sum, without there being any absolute certainty of securing water at the finish. Before deciding the matter, however, the Board are going to request Professor Green to personally inspect the borehole and district, and to further report upon the matter. In the meantime, the Local Government Board will be asked whether they will allow the money for boring to be borrowed, and the repayment spread over a number of years. The Ratepayers' Association last Wednesday passed a resolution requesting the Local Board not to spend further money on the borehole.

LEGAL INTELLIGENCE.

SOUTH SHIELDS POLICE COURT.—Monday, Sept. 24.

(*Before Dr.* GOWANS *and Messrs.* NICHOLSON *and* DOWNEY.)

Deficiency in the Quality of the South Shields Company's Gas.

To-day the South Shields Gas Company were summoned, at the instance of the Corporation, for supplying, on Aug. 29 and Sept. 4, gas which was not of the standard purity required by Act of Parliament.

The TOWN CLERK (Mr. J. M. Hayton, B.A.) appeared for the Corporation; Mr. J. O. DAVIDSON represented the Company.

The TOWN CLERK, in opening the case, said the proceedings were taken against the Company for two offences under the Gas-Works Clauses Act, 1871. By this Act the Corporation were empowered to appoint a Gas Examiner for the purpose of testing the quality and illuminating power of the gas supplied to the consumers. The South Shields Gas Act of 1867 provided that the Company should not allow more than 20 grains of sulphur in 100 cubic feet of gas; and, under the Gas-Works Clauses Act, provision was made for imposing penalties for non-compliance with this provision. On the 29th of August, in pursuance of his authority, the Gas Examiner (Mr. J. Pattinson) made a test of the gas, and found it contained 24·5 grains of sulphur per 100 cubic feet. Under these circumstances, the Corporation ordered a further test. Mr. Pattinson made this on the 4th of September, and reported the result as showing 25·98 grains of sulphur. Whereupon the Corporation thought they were bound, on behalf of the consumers, to bring the matter before the Court. It was not the province of the Corporation to ask the Company for an explanation of this excess of sulphur, any more than they had to ask a milk seller for reasons why there was water in his milk. Under the Act, there was no margin for excuse. The mere fact that there was the excess was an offence under the Act.

Mr. *J. Pattinson* was then called, and said he had held the appointment of Gas Examiner to the Corporation since 1872. He bore out the statement of the Town Clerk as to his analyses; adding that sulphur in gas was a deleterious substance, and had injurious effects upon fittings and vegetation.

In cross-examination by Mr. DAVIDSON, witness stated that the excess of 4 grains of sulphur would not cause any appreciable damage, or vitiation of the air. It was difficult sometimes to deal with the sulphur question. It was possible that the allowance might be 22 grains in some local Acts of Parliament; and, under certain conditions, it might be raised to even 25 grains. When he visited the Company's premises on the 29th of August, there were extraordinary circumstances operating which would more or less interfere with the working. It might be that, owing to the Scotch colliers' strike, there was some difficulty in getting cannel. Excepting by the process of testing such as he had carried out, it was impossible to ascertain any excess of sulphur the gas might contain; and, having found out the defect, it would take some time to detect the cause and apply the remedy. Generally, the quantity of sulphur in the gas at these works was exceedingly low; but it had been above the standard on one or two occasions. The Engineer of the Company (Mr. W. J. Warner) was always extremely anxious to keep it down; and the Company had adopted all the most improved methods for doing so. He found that there was no sulphuretted hydrogen in the gas, and that the illuminating power was 16·2 sperm candles which was two points better that the standard required. The Company had committed an offence according to law; but it was not a material point.

By the TOWN CLERK: It was possible to reduce the amount of sulphur in any coal to the specified limit.

Mr. *W. Coates*, the Deputy Town Clerk, produced minutes as to Mr. Pattinson's appointment and the authority for the proceedings.

Mr. DAVIDSON contended that, under section 29 of the Gas-Works Clauses Act, the Gas Examiner had been appointed from year to year; and that the last appointment was made in 1879, since which date the Local Authority had not kept appointed such an official, in the manner required by the section. Consequently, Mr. Pattinson was not the Gas Examiner at present, and South Shields had no such official, according to law.

The TOWN CLERK contended that Mr. Pattinson's appointment being made permanent in 1879 was sufficient for all purposes.

The BENCH overruled the objection.

A second objection raised on behalf of the defendants—viz., that Mr. Pattinson, on going into their works to make the test, did not produce the order for his appointment, in conformity with section 34 of the South Shields Gas Act, 1867—was also overruled.

Mr. DAVIDSON then objected that Mr. Pattinson did not make and deliver to the Company a report of the results of his tests, as required by section 33 of the Act of 1871.

Mr. *Pattinson*, recalled, said he reported to Mr. Warner the excess of sulphur, but did not send in a report similar to the one presented to the Council.

The BENCH, after consultation, allowed the objection, and dismissed the first summons.

The second case was then gone into; similar evidence being given.

Mr. *Pattinson* stated that he supplied to the defendants a complete report of his test of the gas on the 4th of September.

In cross-examination by Mr. DAVIDSON, witness stated that he could not say he posted the report himself; but he was under the impression that he did so. He did not know he was required by law to do that. He started the test on the 4th; and it was continued for 20 hours. He did not attend the works personally on the 5th, when the results were taken; but he was represented by his assistant.

By the BENCH: He could not say he did the analysis from beginning to end. It was partly done by his agent. He took the responsibility, and superintended the accuracy of the results.

Mr. DAVIDSON repeated the first two objections taken in the opening case; and they were again overruled. He then raised a third objection, that Mr. Pattinson did not make the test personally and wholly, as required by the Act of 1871; and that, therefore, the prosecution must fail.

The BENCH decided that the third objection was not a valid one.

Mr. DAVIDSON then addressed the Court for the defence. He said that, as far as the merits of the case were concerned, the evidence of Mr. Pattinson showed it was based on most trivial grounds. No single complaint had been made against the Company in the Court before; and the action of the Corporation on this occasion amounted not to legitimate prosecution, but to persecution. The Company's supplies from the Scotch colliery were partially stopped; and they had to get local coal, which was found to contain more impurity than they anticipated. As soon as they found this out, they stopped the supply; but the Corporation did not give them time, having found out the defect, to remedy it. The Company's Secretary wrote on the 3rd of September, stating that the matter was receiving attention; but, in spite of this, the Town Clerk was authorized to take these proceedings on the following day. Since then, the Company had reduced the sulphur to 8·80 grains, while they were allowed 20 grains.

After a brief consultation,

The CHAIRMAN said the Bench had come to the conclusion that the Company had broken the law; but the evidence showed that they had taken reasonable means for carrying on their business properly, and that it was owing to an accident more than to anything else that the excess of sulphur complained of occurred. They imposed, therefore, only a small penalty of £2.

On the application of Mr. DAVIDSON, a case was stated for appeal.

Tavistock Gas Company.—At the annual meeting of the Tavistock Gas Company yesterday week, it was reported that the rental from private lighting from the year ending June 30 amounted to £1704, and from public lighting to £461. The consumption was somewhat in excess of the previous year. The lease of the works expires at Lady-day next; and arrangements have been made with the Duke of Bedford to continue the business on the same premises on a yearly tenancy, subject to two years' notice to quit. The sum of £640, equal to 16s. per share, was paid to the shareholders during the year as dividend.

Progress of Electric Lighting in Leeds.—When the works of the Yorkshire House-to-House Electricity Company were formally opened in May last year, their capacity was 600 indicated horse power; but the Directors have now thought fit, in view of the expansion of the business, to raise it to 1800 indicated horse power. The new plant which has been added comprises three additional Lancashire boilers, 30 ft. by 8 ft.; three horizontal condensing engines, each of 400 indicated horse power; and three 200 kilo-watt alternating current dynamos. In June, 1893, the number of 8-candle power lamps connected was 7000; and this has since steadily mounted up to 15,000.

The Proposed Diminution of the Lighting of Liverpool Streets.—The inspection made by the Fire Police Sub-Committee of the lighting arrangements of the city on the night of the 17th inst. (briefly referred to in our last issue), was the subject of a report to the Liverpool Corporation Watch Committee at their meeting yesterday week. Very little has transpired as to the nature of the document; but it appears that their proposals involve the lighting of the lamps by Corporation men, instead of by the employees of the Gas Company, as at present, and also a reduction in the power of the ordinary street lamps after midnight. It is estimated that if the Sub-Committee's recommendations are carried into effect, an annual saving of £7012 will be effected. The report was approved, and a copy ordered to be sent to each member of the Council.

New Filter-Beds for the Southwark and Vauxhall Water Company.—Last Tuesday week a number of the Directors of the Southwark and Vauxhall Water Company had luncheon together at their premises in the Balaclava Road, Surbiton; the occasion being the completion of one of two new filter-beds. These additions will bring up the total number of beds used by the Company to twelve. Their water area is larger than that of any of the existing ten—being 1a. 2c. 1½p., and 1a. 1r. 35½p. respectively; and the depth is 13 feet. The work is being carried out by Messrs. T. Docwra and Sons, of Ball's Pond, London; and it has given constant employment for some time to upwards of 200 hands. The foundation of each bed is formed of a thick layer of concrete; and the same material, together with a lining of bricks, has been used for the sides. The filtering arrangements are of the most perfect order; the water, before it reaches the channels which lead to the pumps, having to percolate nearly 8 feet of cleansing material. This is composed of 3 feet of sand, which forms the surface of the beds, 2 ft. 6 in. of shingle, and 2 feet of larger stones, the whole of which was excavated from the sites of the beds themselves. The twelfth bed will be ready for use very shortly.

The Sale of the St. Ives Gas-Works.—"A Shareholder" in the St. Ives Gas Company, whose inquiry as to what had become of the Secretary brought forward the letter from Mr. C. Sandell which was given last week (p. 616), has replied thereto in the columns of the *West Briton*. He says: "With respect to Mr. Sandell's offer to give shareholders any particulars of facts, I am afraid past experience shows it to have been impossible to get any reliable or satisfactory information. Apart from my own case, I am informed by another unfortunate shareholder that the only satisfaction obtained was a statement some time ago that the concern was 'still flourishing.' It is reported that no proper statement of affairs or balance-sheet has ever been issued; and certainly I have never received one, although the Company was formed in the early part of 1893. It is all nonsense to speak of 'rumours of war,' and to make this an excuse for withholding any statement. The information I ask for, and which I seek, is: (1) Why were not the shareholders fully informed of the turn of affairs, and of the intended sale of the works? (2) Why do the Directors not appear to have stayed execution, considering such a small sum was involved? (3) What has become of the subscribed capital? and what has become of the revenue? In the interest of the public, I conceive these questions ought to be answered through the Press; but assuming Mr. Sandell can see some diplomatic reason against such a course, why not embody the information in a straightforward and full statement of affairs to every shareholder? It is absurd to ask shareholders individually to communicate with him, when they are entitled as a body to receive an authoritative statement."

MISCELLANEOUS NEWS.

EDINBURGH AND LEITH GAS COMMISSION.

Reduction in the Price of Gas.

At a Meeting of the Edinburgh and Leith Gas Commission on Monday of last week—Lord Provost Sir JAMES A. RUSSELL in the chair—the Works Committee submitted the following report by the Treasurer, Mr. J. S. Gibb, as to the price and quality of the gas:—

	Cost per 1000 Cub. Ft. of Gas. Edinburgh Works.	Leith Works.
Coal	14·89d.	13·86d.
Less return for residuals	4·00	3·86
	10·89d.	10·00d.
Manufacturing charges and wages including purification	7·29	7·31
Repairs, maintenance, and renewal of works and plant	1·40	1·80
Repairs, maintenance, and renewal of mains, services, and meters	3·04	2·50
Distribution charges	0·72	0·72
	23·34d.	22·33d.
Average of the above estimates on the production of the two works		23·00d.
Capital and all other charges besides the foregoing		12·51
Total charge per 1000 cubic feet of gas made		35·51
Unaccounted-for gas last year was 8·83 per cent.		3·13
Total cost per 1000 cubic feet of gas sold		38·64d.

Illuminating power of gas, 24 to 26 candles.

The Committee recommended, in terms of this report, that the price of gas be fixed at 3s. 2d. per 1000 cubic feet, subject to the present rates of discount; the charge for public lighting in Edinburgh and Leith to be 2s. 3d. net per 1000 cubic feet—to take effect on all accounts issued subsequently to the usual accounts rendered in October and November.

Mr. KINLOCH ANDERSON, the Convener of the Committee, in moving the adoption of the recommendation, said it was proposed to reduce the price of gas from 3s. 6d. to 3s. 2d. per 1000 cubic feet; and the Works Committee were very pleased to be able to recommend the reduction. It had been brought about by careful and economical working at both their stations; by the reduction in the price of coal; by the improved value of residuals; and by the increased consumption of gas. The net estimate of the Engineers was a cost of 3s. 2·64d.; and the recommendation of the Committee was that they should offer it to consumers at 3s. 2d., which was an apparent loss of slightly more than ½d. per 1000 cubic feet. The Works Committee felt warranted in making the recommendation, when they considered that there was a possibility of a further increase in the value of residuals, and also quite a probability that the lower price of gas would cause a very much increased consumption of it. If this were so, they would at the end of the year find themselves with a profit, which would meet the apparent loss of ½d. But failing their realizing what they expected in this respect, they had a large reserve fund, amounting to £37,000. Of this sum, however, £17,000 was practically pledged to capital account, and was not available; but they still had £20,000 which was available. Now this belonged to the consumers; and he thought that, seeing it was obtained from the consumers, they were entitled to get something of it back. If they did not succeed in meeting the ½d. during the year, it merely meant a possible loss of £3000; and this loss they could make up out of the sum of £20,000 which they had in hand. He thought they were entitled, under clause 79 of their Act of Parliament, to take into consideration the whole surplus which they had; and it might have been a fair enough proposal to reduce the price of gas—not to 3s. 2d. but to 3s., and to absorb the whole of the surplus. But the Works Committee thought it desirable not to fix a lower price than one they might reasonably expect to maintain; and he believed there was a reasonable prospect that they would be able to maintain the price at 3s. 2d. The gas consumption, he apprehended, would go up by "leaps and bounds," notwithstanding that there was a competing illuminant. That there would be an improved demand, had manifested itself during the past year, and since this year began. During last year the increase of gas sold, as against the previous year, was 39 million cubic feet; and this year, since the 15th of May, it was 11 millions. The increase was therefore going on; and it had been noticed in past years that the same thing had occurred. He did not take credit to the Works Committee for the reduction; but it was worth mentioning, nevertheless, that the price of gas had been reduced from 4s. 6d. to 3s. 2d. per 1000 cubic feet. Although they took no credit, they were very pleased at the state of affairs. He thought it would not be at all out of place in this connection to read some notes he had with him as to the advantages the public had had since the formation of the Gas Commission, as compared with what existed under the Companies. Comparing the quality and price of gas supplied by the Companies in recent years, as well as the price of coal, with the same points under the Commissioners, the public had been getting gas at a lower rate, on the whole, than under the Companies. Gas consumers had also had a benefit of from £8000 to £9000 per annum by the abolition of meter-rents. Ratepayers had had an annual benefit of about £4000 in the reduced charge for public lighting. The Commissioners paid to workmen higher wages to the extent of at least £7500. These made, in all, a sum of £20,000 per annum, which was equivalent to 4d. per 1000 cubic feet of gas sold; and it made, for the five years of the Commission, £100,000. Besides this, in addition to maintaining their works and plant in good order out of revenue, about £34,000 had been spent in improving the efficiency of the works. Further, the Commissioners had set aside, as sinking funds for the redemption of annuities and mortgages, the sum of £64,552. He thought, therefore, that those who were opposed to the acquiring of

the gas undertaking some years ago, should now be able to see that the undertakings had made good progress in the hands of the Commissioners. The price of gas would be the lowest at which it had ever been sold in the city—the lowest under the Companies having been 3s. 6d. From what he had shown, it might be said that they were giving gas at 2s. 10d. per 1000 cubic feet.

Bailie ARCHIBALD seconded the motion, which was agreed to.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

The Half-Yearly Meeting of this Company was held on Saturday—Mr. EDWARD FOTTRELL, J.P., in the chair.

The SECRETARY and MANAGER (Mr. W. F. Cotton, J.P.) read the notice convening the meeting; and the Directors' report and the accounts were then submitted. The principal portions of the former were published in last week's issue; and from the latter we learn that the total capital received to June 30 amounted to £949,906, of which £939,220 had been expended—the outlay in the six months having been £2482. On the credit side of the revenue account appeared the following items: Gas, £101,983 (excluding shillings and pence); meter-rental, £2893; residual products, £25,839; rents, £206; and transfer fees, £43—making a total income of £130,966. The total outlay was £91,091, which was divided as follows: Coal, including all expenses, £32,008; cannel and oil, £16,607; purifying materials, £455; salaries of engineers and officers at works, £1401; wages at works, £12,297; repairs and maintenance of works and plant, £8240; distribution, £6451; public lamps, £516; rents, rates, and taxes, £3570; management, £5840; law charges, £353; bad debts, £350; abatements and allowances, £2499; and annuity account, £500. The balance carried to profit and loss account was £39,874; and this account showed that, after providing for interest on loan capital, &c., the balance of net profit (with £1180 brought forward) was £35,933. The contingent fund on June 30 stood at £4582; the reserve fund, at £40,434; the renewal fund (leasehold), at £902 18s.; and the insurance fund, at £2614. During the six months, 51,337 tons of ordinary coal were carbonized, and (in addition to oil spirit) 10,472 tons of cannel. The quantity of gas made was 639,705,000 cubic feet; and the estimate of residuals produced was: Coke, 76,602 chaldrons; breeze, 10,178 chaldrons; tar, 595,177 gallons; ammoniacal liquor, 1,547,020 gallons.

The CHAIRMAN, in moving the adoption of the report, said the accounts showed a marked improvement compared with the corresponding period of 1893; there being a rise in the profits of nearly £12,000. This was accounted for by an increase in the quantity of gas made of nearly 22 million feet, notwithstanding the electric light. The receipts for residuals also bore favourable comparison. Under this head there was an increase of £4200. As regards coal and cannel contracts, the Company were now feeling the benefit of having made them on favourable terms. The works and outdoor plant had been maintained in a thorough state of efficiency. One of the gasholders was in course of being repaired; and the Directors were assured that, when finished, it would be a better holder than it was when first constructed, more than thirty years since. They were supplementing the reserve fund by £2000, which would leave, after paying the dividends, £293 to be carried to the next account. For the past couple of years they had been drawing extensively on the reserve, in consequence of troubles in the coal market. They, however, preferred adopting this course to increasing the price of gas, which was done by most companies and corporations; and they trusted they would presently be able to recoup the fund. The Board regretted that their relations with the Corporation were still strained. They had been obliged to serve a writ for the cost of work done by their orders, not until they had exhausted every other means to procure payment of the accounts—a portion consisting of money paid to them for reinstating parts of the roads opened by their directions. There was also a dispute relative to the meters which that body had fixed to the public lamps. Under the terms of the award made some time since, the meters were to have been proper ones for an average system with one meter to every twentieth lamp. Those which had been fixed were most unsuitable. The majority of them had from time to time stopped registering; but notwithstanding this, and the fact that the Gas Committee's officers had admitted, in writing, their defects, the Committee had declined to have them repaired. There was another matter to which he was desirous of calling attention—viz., the reports published nearly every week, purporting to be the results of tests made of the illuminating power of the gas. There were two officers testing the gas in the city—one being appointed by the Corporation, the other by the Board of Trade. The former reported the gas frequently about 3 candles below the standard, which was 16 candles. The latter, whose testings were legally performed, made it over 16 candles—the standard. If the Committee considered the tests made by their officer reliable, they were, in the interests of the citizens, in duty bound to proceed against the Company. Every fair-minded man must admit that this would be the straightforward and honourable course to pursue, instead of persisting in publishing reports with the object of injuring the Company, while the public were misled. The Directors had the Board of Trade returns of the gas tested on the proper system; and there it was clearly shown that they had kept up to the proper standard. It was for this reason only that he had supplemented his observations by the remarks with regard to another body in the city which they should all hold in respect.

Mr. J. WIGHAM seconded the motion.

Dividends at the rates of 10½ and 7½ per cent. per annum were then declared.

Mr. W. ANDERSON, J.P., proposed a vote of thanks to the Directors, Secretary, and officials of the Company, for the very able manner in which the business had been conducted during the past half year.

Mr. J. ABRAHAM, J.P., said he had much pleasure in seconding the motion, especially when he found that nothing had been taken from the reserve fund this time, but that, on the contrary, £2000 had been added to it, which he thought was very creditable after the half-year's working. He was sure the business of the Company was well conducted by their fellow-citizens constituting the Board, in whom the shareholders had every confidence.

The motion was carried unanimously.

The CHAIRMAN having returned thanks,

Mr. DAVIS, J.P., said he thought the Engineer and Assistant-Engineer deserved special mention, as there was a saving of about £4000 in the residual products. He therefore proposed a vote of thanks to Mr. Waterfield, the Engineer, and Mr. Cotton, the Assistant-Engineer of the Company.

The CHAIRMAN said these gentlemen were included in the previous resolution; but he would not stand in the way of a special vote to them.

Mr. DRUMMOND said that, as a Director, he had great pleasure in seconding the motion. He did not know any officers who attended better to the interests of the concern than these two gentlemen.

The motion having been carried unanimously, the proceedings closed.

SHREWSBURY GAS COMPANY.

The Ordinary General Meeting of this Company was held last Wednesday—Mr. J. S. PHILLIPS in the chair.

The SECRETARY and MANAGER (Mr. W. Belton) having read the notice convening the meeting, the report of the Directors and the accounts for the year ending June 30 last were taken as read. The Directors stated that there had been a decrease of 4¼ per cent. in the consumption of gas during the year, chiefly owing to the exceptionally fine season. The unaccounted-for gas was 5·68 per cent. The coal strike of last autumn, commencing directly after the new coal contracts had been made, and while the stock in hand was small, entailed a loss of about £2600 to the Company; and it was necessary to increase the price of gas 3d. per 1000 feet from Nov. 16 last. This increase had been remitted as from the end of the past June quarter. The returns from residuals had somewhat improved, owing to successful treatment of the difficulties which previously prevented the manufacture of sulphate of ammonia. Tar had, however, yielded less than several years past. The accounts showed receipts to the amount of £26,383, and expenditure to the extent of £22,978—leaving a balance of £3405. The available balance of profit was £2788; and the Directors recommended the declaration of the authorized dividend. This, after deducting the interim dividend paid in March, would absorb £2265, and leave £523 to be carried forward.

The CHAIRMAN, in moving the adoption of the report, referred to the loss the Company had sustained by the resignation of Dr. Brookes, their late Chairman, who had done excellent work for the undertaking. He then went on to remark that the capital account had been increased during the past twelve months by an amount which, looking at the money they had received, was rather more than 10 per cent.; and they had encountered a most disastrous coal strike, which had entailed a loss of about £2600. That strike had not only inflicted a severe loss upon them, but also upon the whole of the trading and manufacturing industries of the country; but he was sure that the people who suffered most were the unfortunate workmen through whose fault the strike arose. On May 11, the Directors took power to increase the capital; and they decided to offer £5000 of stock by tender. For this they received 25 tenders; amounting in the aggregate to £22,314 14s. 5d., at prices varying from £170 to £175. Those applications above £172 received their allotments in full; those who tendered at £172 received a *pro ratâ* amount; while those below that sum, he was sorry to say, were unable to get what they required. The net result was that they received £8608 16s. 3d. for the £5000 of stock; and as the whole expenditure on the operation only amounted to £10 16s. 3d., the Company netted £8598 by the transaction. He thought they might congratulate themselves on the result. It afforded striking testimony, if any were needed, of the estimation in which the Company's stock was held by the investing public. Turning to the revenue account, there were certain items in it to which he should like to call attention. First, there was a reduction in the make of gas; the reason being that they had an exceptionally fine and mild season following upon a very cold one, and naturally there was not so much gas consumed. At the same time he did not mean to say that the increase in the price which the Directors were unfortunately bound to charge, did not have some effect in making people more economical in the use of gas than they otherwise would have been. The receipts from the sale of gas were more; as were also those for breeze and coke, although they sold 897 tons less. The reason for this was that during certain months they used less coal, and therefore they could not make so much coke; but at the same time they obtained a better price for it. For tar they had received £226 less than in the preceding year, the tar market being in a very bad condition; but as to sulphate of ammonia, the receipts were the most satisfactory in the whole of their accounts. They amounted to £855 more; and this increase was owing to their being able to resume the manufacture of sulphate under the Belton and Davies process. Turning to the other side of the revenue account, coals had cost £1019 more than last year, although they used 1949 tons less. This was in a large measure owing to the improved quality of the coal they used. Then they had saved money under the head of "purifying," and the wages were down £208. He now came to one very considerable item—namely, "repairs and maintenance of works and plant, £5540 5s. 4d.," which was an increase of £2470 over last year; but he thought he could satisfactorily explain this increase. In the first place, £834 was spent on the reconstruction of the sulphate plant; £300 was expended on improving the dwelling-house attached to the works; and they had written £1000 off the suspense account, whereas last year they charged £1200 to that account. The plant and everything connected with the works had been kept in the highest state of efficiency. The average cost for repairs and maintenance of the different gas-works in the kingdom was about 5¼d. per 1000 cubic feet of gas sold; and as the Shrewsbury Company sold 125 million cubic feet of gas, their average cost would be something like £2864. The bad debts only amounted to £66 on a collection of some £28,551. The reserve fund was now absolutely filled up; and they were not allowed to increase it beyond £8000. Turning next to the general balance-sheet, there was an item of £3524 for stores on hand—coals. They had about 6000 tons of coal now in stock; and the Directors were determined to store up as much as they could

to meet any possible emergency. Last year the stock was abnormally low, as the Directors contemplated making fresh contracts. The Chairman then gave some figures, showing the great progress the Company had made since its formation, remarking that while they only produced 135 million cubic feet of gas per annum, the capacity of the works had been increased to 180 millions. Before sitting down, he desired to thank their Engineer and Secretary for his zealous attention to his duties. Had it not been for the foresight of Mr. Belton, the loss over the coal strike would have been very much greater; and in thanking him, the Directors desired to thank the rest of the employees for their efficient services.

Mr. W. BEACALL seconded the motion; and it was carried.

It was next resolved—"That a dividend for the year ending June 30 last be declared at the rate of 7½ per cent. per annum upon the Company's stock, deducting the interim dividend of 3¾ per cent. paid in March last."

Votes of thanks were then accorded to the Chairman and Directors, the Secretary and Manager, and the officers; and the proceedings closed.

LEICESTER CORPORATION GAS AND WATER UNDERTAKINGS.

The Half-Yearly Accounts—Grave Position of the Water Supply.

At the Meeting of the Leicester Town Council last Tuesday—the MAYOR (Alderman Hart) presiding—the Gas and Water Committees submitted their accounts for the half year ending June 30 last, and Alderman Wood made a statement respecting the diminishing supply of water.

The Gas Committee reported that the net profit for the six months, after paying interest on the capital, was £17,311. Out of this had been paid £3262, being the half-year's amount of sinking fund; leaving a balance of £14,049 to be applied at the end of the official year (March 31 next) as the Council may direct. The accounts include the results of the working of the residual products manufactory and gas-fitting business. The net amount realized by the residuals was £10,053; and the working of the gas-fitting business showed a net profit of £113. During the half year 55,527 tons of coal were carbonized; and the quantity of gas made was 566,437,000 cubic feet, as against 544,742,000 feet in the corresponding period of last year—being an increase of 21,695,000 feet, or 3·98 per cent.

Alderman LENNARD, in moving the adoption of the report, said that the June half of last year only yielded them £10,677; so that they had a gain of £3372. He might say that the £14,049 net profit, which would be at the disposal of the Council at the end of the financial year, was the largest half-year's profit they had ever had in the history of the department, with the exception of one, and that was the second half of 1890. It would be noticed that the coal cost £28,622; and they would be surprised to hear that, although they had carbonized more coal, there was a decrease in the cost of £1700, as compared with the corresponding six months. The coal cost them only 10s. 4d. per ton during the six months, as against 12s. per ton for the corresponding half of last year. Of course, the advancing price of coal had been in their minds for the last nine months; but they had probably overlooked the fact that the coal they had been using in the first half of 1893 was bought in the beginning of 1892. This was when they purchased coal cheap; and although the strike or lock-out took place and stopped the pits for a long time, they had had every ounce of the contract quantity during 1893, so that part of the loss which occurred in 1893 had been brought back to them in the beginning of 1894. They had carbonized 65,527 tons of coal, and the increased make of gas for the half year—and that was one of the greatest sources of revenue—had been 3·98 per cent., or nearly 4 per cent. increase. They had about 6500 stoves out on hire; and there were upwards of 400 gas-engines in use.

Mr. BILLINGS seconded the motion.

Mr. WOOLLEY remarked that, having regard to the splendid position of the gas undertaking, this was a grand opportunity to "free" the meters.

Alderman Sir T. WRIGHT pointed out that a great many people owned their own meters.

Mr. WAKERLEY suggested that a small fund should be established for the purchase of meters from private owners.

Mr. ROWLETT opposed doing away with meter-rents, as it would be a loss of revenue.

Alderman LENNARD, in reply, said the Committee some years ago reduced the rent of meters; and at the present time they did not get a farthing profit from hiring-out small meters. They had already in Leicester 150 "penny-in-the-slot" meters, and had ordered 150 more.

The report was adopted.

Alderman LENNARD in subsequently moving the adoption of the minutes of the Committee, stated that they had at present 25,000 customers. He urged that, simply because they had had a successful half year, committees should not exceed their estimates; but that, when the money was available, it might be appropriated to the reduction of the rates by at least 4d. in the pound.

The minutes were adopted.

The accounts of the Water Committee showed a net profit, after paying interest on the capital, of £6422. Out of this had been paid £2168, the half-year's amount of sinking fund; leaving a net balance of £4254, to be dealt with at the close of the current financial year.

Alderman WOOD, in proposing the adoption of the report, said that, as compared with the corresponding period of last year, when there was a net profit of £6043, they had a diminution of profit. This was due to the increased capital charges involved by the large works they were engaged upon. In connection with the new reservoir, they had purchased land, and were spending money in the development of the work, which would be totally unproductive for some years to come. In view of this circumstance, unless they had an increased revenue, the profits were likely to be reduced for a while. Passing on to allude to the present state of the water supply, he pointed out that there was only 17½ days' supply available; and the town must know that this was the very "end of the chapter," unless there was a fall of rain, or they were able to obtain an additional source of supply. The reservoirs were perfectly sound; and the failure of the supply was due exclusively to the diminished rainfall. In 1891, they had over 31 inches of rain; in 1892, only 22·25 inches; in 1893, 21·73 inches; and up to the present time this year, they had had only 15·45 inches. They had thus had a very short supply, particularly during the last four months. The rainfall in June was 2·09 inches; in July, 2·47 inches; in August, 2·57 inches; and in September, up to the previous night, there had not been half an inch. It would therefore be clearly seen that Leicester had not been so favoured in the matter of rainfall as other parts of the country had been, nor had they had an average rainfall. During the last few years, they had suffered to the extent of nearly 7 inches per annum in the rainfall; and this was the cause of the present difficulties. After pointing out that there had been no delay in starting the Swithland works, Alderman Wood described the efforts that had been made to obtain additional supplies. In conclusion, he said the weakness had been that they commenced the year with empty reservoirs, and the rainfall had been small; and he asked the inhabitants to do their best to help the Water Committee through the present crisis.

Mr. COLEMAN seconded the motion, which was agreed to.

The officials of the Water Department are making every effort to secure additional supplies of water, in view of the small and rapidly diminishing stock now remaining in the reservoirs at Bradgate and Thornton. Under the direction of the Engineer (Mr. F. Griffith) a shaft, 10 feet square, has been sunk on the Bedehouse Meadows; and last Tuesday water was found at a depth of 8 feet. The pumping appliances are in readiness; and no time will be lost in commencing the operations necessary for transferring the water into the mains. It is anticipated that a considerable supply will be available from this source when a greater depth is attained. The water, which is of average quality, will be pumped direct into the mains under pressure. Negotiations for sinking wells in other districts are also in progress. There was a little rain on Tuesday; but this is described as "a drop in the ocean" compared with what is necessary before the anxieties of the Water Committee can to any extent be relieved.

THE COMPETING GAS COMPANIES IN MONTREAL.

Fusion of the Undertakings.

We learn from Montreal papers just to hand, that arrangements have been made by which the undertaking of the lately-formed Consumers' Company is to be acquired by the Montreal Gas Company—a sum of $400,000 to be paid for the plant, privileges, &c. This amount is to be payable in Montreal gas stock at par, which, at present prices, will, we understand, mean about $720,000. The price of gas has been reduced from $1·35 to 95c. per 1000 cubic feet; but the possibility is that it may be increased after the amalgamation. It will be remembered that it is some two years since Messrs. Coates and King arrived in Montreal, and purchased from the St. Henri Light and Power Company their charter, or rather that portion of it relating to the supply of gas in the municipalities of St. Henri and Ste. Cuengonde. Unknown to the Montreal Gas Company, there was a clause in the charter which permitted its owners to lay gas-pipes in Montreal. The price paid for the charter by Messrs. Coates and King was $50,000—half in cash, and half in stock in the Consumers' Company. The latter Company secured exclusive franchises for the supply of gas in the two municipalities mentioned, and also succeeded in getting a 15 years' contract from the City—this contract to come into effect next year, when the City's contract with the old Company will expire. The works of the new Company are pretty far advanced. The material required was supplied from the Whessoe Foundry, of Darlington, with a party of men, who arrived in the first week of August this year, and the gasholder tank, which is 114 ft. 6 in. diameter, 27 feet deep, and weighs 143 tons, was completed on Sept. 22—only seven weeks being occupied with the work. The Contractors are now making rapid progress with the large gasholder at the Company's works, and expect to finish it within the contract time—the 15th prox. The capacity of this holder, when added to the existing relief holder, will enable the Company to send out a million cubic feet of gas per day. At present they are supplying some 500 customers in parts of the city where the old Company are not allowed to fix any more services. About 25 miles of mains and services have already been laid.

THE ELECTRIC LIGHTING AT LONDONDERRY.

According to reports which have lately appeared in the Londonderry papers, the electric lighting scheme of the Corporation, to which several references have been made in the JOURNAL, is not giving the satisfaction which its supporters hoped and expected. Trouble has attended it from the commencement. First it was the lamps; and now the frequent interruptions in the lighting are the subject of public comment. There is something manifestly wrong; and the conclusion has not unnaturally been come to that the cable is defective. For a couple of nights lately no less than 40 lamps were out; but the lighting was restored as promptly as possible. The Engineer to the Corporation (Mr. H. W. Blake) has already been in communication on the matter with Messrs. Siemens Bros. and Co., Limited, the contractors for the lighting; but they do not seem to be able to offer any satisfactory explanation. They state that, in the construction of the cables, only the best materials and workmanship were used, and that the cables bore well the very severe tests to which they were submitted before leaving the works. They, therefore, cannot understand the reason for their not proving thoroughly reliable in actual work. They say it would almost appear that there is some mysterious action going on of which they have not been able to find the true cause. It seems that the cables were tested at the works with a pressure of 6000 volts

under water; and stood it quite well. One has broken down at about 2200 volts in dry ground, and another broke at 1700 volts. It is a curious thing that, in places where the ground is wettest, there has been no fault; and it is also remarkable that, at points where the pressure was lowest, bursts have happened. The breaks occur mostly in places where the cable is only 12 or 18 inches below the surface. There was a rumour that, in order to maintain the service last Sunday week, one circuit was kept alive by means of a cable laid upon the ground between two lamps. It has been denied that the cable was used for conveying a current; but this was undoubtedly its purpose. The puzzle to everybody is, as the *Derry Sentinel* remarks, how cables which, according to the specification, should have borne the test of 3000 volts pressure, should have so unaccountably fallen away in their carrying capacity since the 29th of May last. "Street Lighting by Electricity," says the *Sentinel*, "cannot receive a very high character, if the best that can be said for it is that cables tested up to 3000 volts are liable to break down at 1700 volts within a few months. The period for which Messrs. Siemens have to maintain the cables will expire at the end of next May; so that it behoves the Corporation to see that to everything is in good going order by that time, or they may be liable constant expense for repairs." There was another break last Thuraday.

EAST LONDON WATER-WORKS COMPANY.

The Half-Yearly Report.

The report of the Directors of the above Company for the six months ending June 24 last has been issued, in view of the half-yearly general meeting next Thursday. It is stated therein that the revenue from all sources amounted to £147,439, as compared with £144,539 in the corresponding period of 1893; being an increase of £2900. The expenditure, including a sum of £2203 paid to the Chamberlain of London, was £62,441, as against £63,389 in 1893; being a decrease of £948. The Directors regard as satisfactory the difference between the revenue and the expenditure (£84,998), as well as the increase in the amount of the unappropriated balance from £7767 to £10,086. The extensions of works, machinery, and mains are proceeding with all despatch; and the whole of the plant is in excellent condition. The quantity of water pumped in the six months covered by the report was 8,181,948,683 gallons, as compared with 8,263,505,543 gallons in the corresponding period of last year. The new services laid on numbered 2103, against 1878; the total number now in supply being 178,043. The reports of the several Analysts continue to show that the water supplied by the Company is of a high standard of purity. The Directors refer with pleasure to the passing of the Company's Bill through Parliament last session, after a prolonged and severe fight; and, although extremely onerous terms have been imposed, they express the hope that the Company will now be in a position to provide for the pressing necessities of the outlying Essex district, and to improve their general supply. The amount of profit available for distribution is £78,866; and the Directors recommend that a dividend on the ordinary stock at the rate of 8 per cent. per annum (less income-tax) be declared. This will absorb £68,780, and leave an unappropriated balance of £10,086.

THE THIRLMERE WATER-WORKS OF THE MANCHESTER CORPORATION.

An Important Arbitration.

At the Surveyors' Institution, Westminster, last Wednesday, Mr. Christopher Oakley, the Umpire appointed by the Board of Trade, commenced the hearing of the case of the Hon. James Lowther, M.P., *v.* The Manchester Corporation—the question to be decided being the amount which the latter are to pay to the Trustee of the estates of the Earl of Lonsdale for the easements taken over certain properties and the damage done by carrying through them the aqueduct and pipes conveying water from Thirlmere to Manchester, and also for the injury done to the manorial rights over other properties. Mr. Ernest Page appeared in support of the claim; and Mr. Balfour Browne, Q.C., represented the Manchester Corporation.

From the opening remarks of Mr. Page, it appeared that there was likely to be some difficulty in finally disposing of every question in dispute between Mr. Lowther and the Corporation in one arbitration, unless there was some amount of give-and-take between them. The claim was divided into two parts—first there was a claim under the notice to treat; and second, and distinct from the first, was the manorial claim. Counsel specified at some length the points of difficulty in regard to the claims, from which it was gathered that the notice to treat was given by the Corporation on Sept. 3, 1885; but it included property which at that time they were not entitled to take. After some discussion, both parties agreed that the award should include all the properties embraced in the notice to treat. Regarding the manorial claim, there seemed to be some doubt whether Lord Lonsdale could prove a title to certain portions of the property; and Mr. Balfour Browne would not waive any rights they might have hereafter to have the award varied in respect to these, although he intimated that there was still the possibility of the Corporation coming to an arrangement.

The ground having been cleared of these preliminary points, Mr. Page proceeded to state his case; referring first to the Act which the Corporation obtained in 1879 empowering them to procure a supply of water from Lake Thirlmere; and, among other things, it entitled them to secure from the landowners between Thirlmere and Manchester the right to lay down pipes and aqueducts. Provisions were made, in section 33 of the Act, for the protection of the Lonsdale estates; one being that there should not be any diversion from the plans and levels without Lord Lonsdale's consent. Having obtained the Act, the Corporation gave his Lordship notice to treat for the lands they required, either to take the land right over for the purpose of the works, or to take easements and the right in perpetuity of constructing, repairing, and relaying pipes and aqueducts and other works on lands specified, and the right of depositing surplus spoil on other lands. Altogether they proposed to take 6 acres 1 rood and 2 perches of land for tunnel, rather over 1 acre for conduit pipes, and about 1¼ acres for other purposes. Upon this notice, Lord Lonsdale made his claim, which was eventually referred to arbitration; the Corporation in the meantime entering upon the land and carrying out the works, making certain deviations in doing so without the consent of his Lordship. The first property was part of Grasmere Common, through which 2338 yards of conduit were laid in tunnel, and 314 yards in cut-and-cover. The tunnel was carried through stone; and part of the claim was in respect of the stone used in constructing the tunnel. Then the Corporation had taken an easement or right in perpetuity of letting the water pass through this property, for which Lord Lonsdale was entitled to compensation. He put the value of this easement at 4d. per yard per annum, which, at 25 years' purchase, worked out to £1100. Then there was the value of the stone taken; and he contended that, by using the stone for the purposes of their work, the Corporation had themselves given it a commercial value. They took 9122 cubic yards of stone and gravel, which at a valuation of 1s. per yard came to £456. The Corporation also took 14,438 cubic yards of stone, which they did not require for their works, but which they threw on one side as spoil. He estimated the value of this at 2d. per yard, giving a sum of £120 6s. 4d., and bringing up the total claim in respect of the Grasmere property to £1680. The second property was the Spital Farm, near Kendal, through which the aqueduct passed for a distance of 637 yards. This farm was valuable as prospective building land; and therefore, for easement through it, he thought Lord Lonsdale ought to be paid at the rate of 2s. per yard for bridges and pipes, and at 3s. a yard for works which altered the surface of the land. This would work out to £1336 5s. In addition, there were, or would eventually be, fifteen air-valve wells at £5 each, and five air wells at £10 each; bringing the total for this property to £1819 7s. 6d. The third property was the Hutton Roof Farm in Westmoreland; and, through this, the aqueduct passed for 2203 yards. The easement at 1s. per yard—the property being less valuable than the Spital Farm—and twenty-five years' purchase, came to £2753 15s. The value of the stone taken was £398 12s. In addition, there were six manholes and one toolhouse at £10 each, £70; and five acres of land used for the deposit of spoil, £437—making a total claim of £3660 for this property. The total for the three properties forming the claim under the notice to treat was therefore £7160. Coming to the second head of claim, relating to the manorial rights to property dealt with by the Corporation, Mr. Page said that this claim related to properties in various townships and parishes over which Lord Lonsdale had manorial rights. The claim was for the minerals taken in the course of constructing the works, and was made up in the same way as in the previous properties. Then there was the claim for the easement which the Corporation had acquired for carrying the aqueduct through the properties under the surface, and the interference with the minerals. If the Corporation had acquired this right by private arrangement, there was no doubt they would have had to pay for it; and he contended that it was never the intention of Parliament that, when a landowner parted with his rights for public works, he should not be compensated at a fair market value. That value did not depend alone on what the minerals were worth to the owner, but also what the worth was to the buyer. Witnesses would be called who had thoroughly considered the whole matter; and they had come to the conclusion that a very moderate sum to be granted for wayleaves through the underground property was £100 per mile. The total number of miles affected was 18; so that under this head a sum of £1800 was claimed. Adding this to the figures already given for the stone actually taken, the total under the manorial claim came to £5760; making a total under the two heads of claim of £12,920. He contended that the principle which had been adopted in making these calculations had already been sanctioned in previous cases. In one case which had arisen in this undertaking—the case of the Countess of Ossalinsky—the Manchester Corporation refused to abide by the decision of an Arbitrator, on the ground that he had taken into consideration in his award matters affecting the value of the property that ought not to have been considered. The case came before Justices Grove and Stephen; and their judgment supported the decision of the Arbitrator. He therefore contended that the principle adopted in the present case had received authoritative sanction.

Evidence was then given by Mr. Joseph Bintley, Surveyor to the Westmoreland County Council, as to a survey he had made of the aqueduct as it passed through Lord Lonsdale's property. He gave the result of his calculations and measurements of the stone taken from the property, his estimates of the value of the same, and indicated the damage to the surface value of the property. On the following day he was subjected to severe cross-examination, and was afterwards re-examined. Among the points brought out, he said, speaking of the manorial claim, that he reckoned the total quantity of rock and other material used by the Corporation for concrete was 66,581 cubic yards, and for building purposes 1796 yards; and, referring to the properties affected by the notice to treat, he stated that the total amount of rock used in the works on them was 16,799 cubic yards for concrete and 295 cubic yards for building. As to the value of the stone taken out of the tunnels, he considered that it was quite worth 1s. per cubic yard for the purpose for which it was used by the Corporation. So far as Dunmail Raise was concerned, where the tunnel was some 260 feet below the surface, he considered that the whole hill was worth 2d. per cubic yard; and he did not think Lord Lonsdale would sell it for less. If the Manchester Corporation had not found this stone on the site of their works, they would have had to buy it elsewhere, and would have been put to great cost for cartage. The next witness was Mr. J. Hudson, the land agent to the Lonsdale estates. He valued the easement in the case of the tunnel at 4½d. per lineal yard, and for the cut-and-cover work at 9d. per yard, because the surface was disturbed; and he calculated the sum at the rate of 25 years' purchase. On account of the value of the Spital Farm as prospective building land, he estimated the easement through it at 2s. per lineal yard; while for the Hulton Roof Farm, he placed the easement at 1s. per yard, because it reduced the letting value of the property for farming

purposes. His total valuation for the properties under the notice to treat was £7149; and under the manorial claim, £5744—the total being £12,893. Mr. John Holmes followed, and expressed the opinion that the land over the cut-and-cover portions of the aqueduct was permanently deteriorated; and he maintained also that the prices of 1s. per cubic yard for the stone used, and 2d. per yard for that put upon the spoil banks, were moderate and fair. There were small differences in detail; but the main figures of this and the succeeding witness (Mr. F. Puncher) worked out to about the same total as Mr. Hudson's.

On Friday last, evidence supporting the estimates of the foregoing witnesses was given by Mr. G. Storey and Mr. T. Fenwick. The latter stated that he thought he was entitled to take into account, in making his calculations, the fact that there were other towns besides Manchester to which it would be a great advantage to obtain a supply of water from Thirlmere, and that this considerably increased the value of a wayleave beyond the actual injury done to the property. Mr. Richard Hassard was next called, and gave particulars of the scheme which he originated some years ago for providing London and other large towns with a water supply from the lakes—principally Thirlmere and Ulleswater. By this scheme, he proposed to obtain a supply of 270 million gallons daily—200 millions for London and 70 millions for other towns. This scheme, along with others, was the subject of an inquiry by a Royal Commission, and had been declared by that Commission to be perfectly feasible. If it had been carried out, there would only be one practicable line by which the water could have been brought south, and that was by Windermere and Kendal. The aqueduct would of necessity have had to pass through Lord Lonsdale's property. The Commission, however, held that it would be unfair for London to take possession of a gathering-ground that geographically belonged to the populous districts of Lancashire and Yorkshire. As to the principle on which payment should be made for wayleave in cases of this kind, he thought that the value of the wayleave to the persons acquiring it ought to be taken into consideration in fixing the compensation paid to owners of private property. In cross-examination, witness stated that the estimated cost of the scheme which he had described was £18,000,000, which was not more for the London of to-day than was the cost of the New River scheme for the London of the time when it was carried into effect. Two other witnesses completed the case for the claimant.

The inquiry was then adjourned to Nov. 1, when Mr. Balfour Browne will open the case for the Manchester Corporation.

CONGRESS OF THE SANITARY INSTITUTE.

The Annual Congress of the Sanitary Institute was opened in Liverpool on Monday last week, under the presidency of Sir FRANCIS SHARP POWELL, Bart., M.P.

The opening meeting was preceded by a public reception in the Town Hall by the Right Hon. the Lord Mayor (Alderman Bowring), and by a luncheon at the Adelphi Hotel—the Lord Mayor presiding. In the afternoon, the business of the congress commenced in the ecture theatre of the University College. The formal matters having been disposed of, the retiring President (Sir C. Cameron) introduced his successor in office, who at once proceeded to deliver his Inaugural Address; choosing for his subject the public health of England and Wales as affected by administration and by law. In the course of his remarks, he dealt with the smoke question. He said his hearers probably knew there was a common saying, in reply to a complaint of nuisance arising from smoke, that "Smoke brings money." But there was, he said, a new and a better adage, "Smoke brings cost." While more regard for the well-being of the neighbourhood might lessen the nuisance, economy of fuel arising from artificial scarcity might compel the adoption of arrangements which would lessen the discharge of smoke into the atmosphere, both from manufactories and from private dwellings. The advance of chemical knowledge and mechanical skill year by year brought under control gases and other residual products hitherto destructive both to health and comfort. The Act of 1892, which extended widely the number of distinct processes brought under the Alkali Act, had now come into effective operation. This legislation was not in vain. Of acid from chemical manure works 94·5 per cent. was now arrested in its way to the atmosphere; and sulphate of ammonia, formerly most offensive, was now manufactured, even in fashionable watering-places, without the knowledge or suspicion of those frequenting the health resort. And the value of the commodity—in other words, the saving by the conversion, rather than the rejection of the substance—was estimated at £2,000,000 per annum. In his concluding remarks, the President dealt with the subject of the improvement of towns, and referred to the gas-engine and electricity as agents for the production of motion and light which would tend to remove many debilitating and uncivilizing influences.

On Tuesday, among the papers read was one by Mr. J. A. Brodie, Assoc.M.Inst.C.E., who was for some time chief assistant to the Liverpool City Engineer, in which he gave a full description of some recent improvements in refuse destructors, particularly alluding to the method of charging the Liverpool destructor. He also explained the principles of the destructor now being constructed for the Corporation of Cambridge; the special object sought to be attained being the generation of steam for sewage-pumping purposes. Mr. J. Deas, the Manager of the Warrington destructor, contributed a paper on "The Disposal of Town and other Refuse by Burning." He pointed out that for many years past the question of dealing with the refuse in towns had occupied the attention of local and municipal authorities, and various schemes had been suggested to remedy the evil. All sanitary reformers and engineers were now agreed that the most economical system, and the safest from a public health point of view, was to destroy the refuse by fire. The necessary conditions for a perfect destructor were: (1) To destroy rapidly all unscreened refuse without committing any offence or possible nuisance; (2) to reduce the refuse dealt with to the least possible amount of clinker; and (3) to deal with the refuse and bye-products with the greatest economy and efficiency. In the new destructor at Warrington, these conditions were, he said, complied with, and successfully carried out.

Mr. H. Royle, Assoc.M.Inst.C.E., described the "Acme" refuse destructors. Dr. H. Littlejohn, of Sheffield, gave an address on "The Present Position of the Sewage Disposal Problem." He said he took it for granted that all sanitarians were agreed that the only method of sewage disposal consistent with modern civilization and sanitary science was that by water carriage. It was now admitted, after prolonged trial, that all conservancy methods were practically failures, both as regarded economical results and what was of more importance—freedom from nuisance. The question of the effective treatment of sewage had assumed an importance that it was impossible to overestimate. Though a considerable number of sanitary authorities had attempted to deal with the question, it must not be taken as representing that they had solved the problem of effectively dealing with their sewage. The second day's proceedings included a ladies' conference; and an evening lecture by Dr. G. B. Longstaffe on "The Overcrowding of Houses upon Land."

The "event" of the third day of the congress was the address of Dr. E. E. Klein, in the Sanitary Science Section, on "The Origin of Typhoid," the intelligent appreciation of which was greatly enhanced by a number of carefully-prepared lantern slides. Dr. Klein showed that the bacillus of typhoid fever and the *bacillus coli communis*, which have generally been regarded as one and the same, are two well-characterized and different species. He said he had in two instances been able to ascertain and to identify the simultaneous presence in water of the *bacillus coli* and of the bacillus of typhoid fever. This was the case at Worthing and at Rotherham—in each instance there being found an abundance of the former and a limited number of the latter; but the two species were easily isolated; and they presented the well-marked differences he had stated. He did not mean to deny the possibility of the existence of intermediate forms, both morphological and cultural, between the two; but he maintained that, as far as direct observation at present went, the *bacilli* named were two distinct species, and that there had not appeared, under the many and diverse conditions of laboratory experiments, any evidence of transitional or intermediate forms between them. Sir Thomas Crawford, in moving a vote of thanks to Dr. Klein, said the address showed the importance of the purity of all water supplies, and the absolute duty, where there was a case of enteric fever, of preventing anything from it finding its way into a public sewer. Dr. Klein, in acknowledging the vote, said he hoped his address would help to convince public bodies of the importance of having a pure water supply for the population. The Municipal and County Engineers discussed the subject of the disposal of town refuse, as raised by the papers read at the previous day's meeting. A number of gentlemen took part in the debate, which referred more to particular forms of destructors than to any general question. One speaker condemned the method of disposing of town refuse by taking it out to sea; but others approved of it because of its cheapness, where there was a strong tidal current. The day closed with a *conversazione* at the Walker Art Gallery.

On Thursday, the President of the Engineering and Architecture Section (Mr. G. F. Deacon, M.Inst.C.E.) devoted a large portion of his address to an account of the Liverpool water supply, with which, as our readers are aware, he was for a long time closely associated. He said it was only natural that the great city in which the members of the Institute were assembled, and in which for 25 years, beginning with 1865, he was professionally engaged, should receive the first share of his remarks. Commencing with the water supply, he said that from the year 1865 the service had been intermittent, under conditions which, as he had occasion to report at the time, and firmly believed now, caused impurities of the most serious kind to find access to the mains during the intermissions, and to be delivered to consumers on each occasion of the resumption of supply. In 1874 the remedy for this state of things was begun. On the last day of 1875, every district in Liverpool had been provided from the old sources with a constant supply of water under higher pressure than before. On that day the valve of the last intermittent district was turned full open with much circumstance and rejoicing by the then Chairman of the Water Committee (the late Mr. J. H. Wilson) to whose energy and steadfast conviction was largely due the completeness of the success attained; and thus before their critical year of 1876, Liverpool had received the full blessing of a constant supply, which had rarely been interrupted since. In that year, the loss of water by leakage, which had been great, had been so far moderated that a supply was given for metered trade purposes augmented by 25 per cent., and unrestricted for domestic and all other purposes to a population already increased by 33,000 persons, with 12 per cent. less water than previously. When to this he added that the revenue went on rising from additional water sold to new populations and to new trade consumers, who continued to be supplied from constantly increasing savings of the water formerly lost by leakage, they would understand the otherwise inexplicable fact that, without any increase in the charge for water, Liverpool continued, from the year 1880 up to the year 1889, to pay the interest upon the expenditure, amounting at that time to more than £1,750,000, incurred in connection with the great scheme of water supply which was opened and brought into use in 1892; and so important had the surplus thus realized continued to be, that even now, after the expenditure of 2¾ millions upon the new works, the charge for domestic water supply—nearly two-thirds of the whole—had only been raised—and that temporarily, he thought—by 1½d. in the pound, while the charge for manufacturing supplies (about one-third of the whole) had been reduced from 9d. to 6d. in the pound. Never, he believed, in the history of water-works, had a financial condition so satisfactory in all its bearings accompanied the completion of new works, the interest upon the cost of which had been defrayed entirely from the revenue of the water-works undertaking. The case of Liverpool, it might be said, must have been exceptional. A pretty large knowledge of the works of this country, and of many of those on the Continent, enabled him to assert that this was not so. In many other places, equally satisfactory results had been attained; and there were still many in which, with proper personal attention, similar results could be attained. But active personal attention—he would almost add enthusiasm—on the part of someone properly qualified in relation to the magnitude of the undertaking, and determined to make his work a success, was a prime necessity. To Liverpool such services had been most ably and most

completely rendered by Mr. Joseph Parry, the present Water Engineer, who from its inception took a leading part in the organization and management of the work which had brought about the remarkable changes explained. In this, as in many other particulars, it would be difficult to over-estimate the value of Mr. Parry's services to the water estate. Exact experiments in different parts of the Metropolis had demonstrated what their general experience in other places, combined with their knowledge of the immutability of natural laws, had previously rendered quite certain—that the same policy could be applied in connection with the London Water Supply, and with the same success. The day was very far distant—if, indeed, it would ever come—when pure mountain water, taken virtually from above the limits of human habitation, or drawn from perfectly safe sources underground, would be insufficient to supply the wants of this country. Till then, was it wise to continue to invest their capital in, and to prolong the life of, undertakings which were dependent for their safety entirely upon the continuity and perfection of artificial processes of purification? Mr. Deacon also referred to the sewerage system, and to the means which had been adopted for the disposal of the refuse and sewage of the city. Professor H. Robinson, M.Inst.C.E., read a paper entitled: "How to Obtain a Pure Water Supply." In it he referred to a few points bearing on the question of water supply that are the outcome of recent observations of chemists and bacteriologists, to whom engineers were, he said, indebted for clearing up difficulties which they had experienced in advising on the subject. It had been contended by some that no stream should be utilized as a source of water supply if it had been subject to the slightest sewage contamination above the point of intake; and that, unless the stream were absolutely free from even the suspicion of sewage pollution, it should be condemned as unfit to furnish a supply of water for dietetic purposes. It was formerly the custom to classify waters as "turbid," "slightly turbid," and "clear;" and analyses of water were made with a view to determining their purity entirely from a chemical standpoint. At the present time, however, a biological investigation was an essential part of the scrutiny that a water had to undergo. The self-purifying action of a stream was an important factor in effecting the destruction of pathogenic germs. If it were not for the natural purification which a river underwent, the continuous discharge of even slight quantities of sewage or polluting matter into it would produce cumulative evils that would in time render every such stream an abomination. The author said he was the last to under-estimate the importance of preserving water supplies in the purest possible condition; but he wished to combat the merely sentimental part of the case, which at times might lead to the imposition of grave burdens on communities in regard to water supply. The standard of purity should be maintained high, and legislation should be made more compulsory to preserve the purity of the streams, both from a sanitary and an æsthetic point of view. Bacteria appeared to multiply more rapidly in pure than in impure water. In unboiled water they were found to multiply slightly; but in boiled water they multiplied greatly. The storeage of river water in impounding reservoirs was not attended with the certainty (as some considered) of the pathogenic germs flourishing and increasing—thus constituting a menace to the community supplied by it. The doubt of the safety of such waters was, after all, a matter of degree, as it was improbable that any source of supply was theoretically free from the liability to pollution. Where there was a probability of contamination, and in order to reduce to a vanishing-point the possibility of any pathogenic germs passing to the consumers, it was necessary to resort to filtration; and in judging whether or not filtration was requisite, the engineer would be guided by the previous history of the water. What was required was efficient filtration; and by constructing the sand filters so as to cultivate a nitrifying action, there could be no question of the possibility of removing all germs. Professor E. Hull, F.R.S., followed with a paper on "The Water Supply of St. Helens from Wells in the New Red Sandstone." In the course of it, he said that St. Helens depended almost wholly upon deep wells sunk in the new red sandstone—a formation which afforded supplies to many large towns in England. The town was built mainly on the coal formation at the western extremity of the great South Lancashire coal-field. But the new red sandstone and permian formations constituted the margin of the coal measures to the south and west; and from these (particularly the former) the supplies of water were drawn for domestic and general purposes. He said it need scarcely be observed that the public wells of St. Helens had been put down, at successive intervals, to meet the requirements of increasing population and manufactures. The number of pumping-stations had now reached five; while a Provisional Order had recently been obtained from the Local Government Board for the construction of a sixth station, which was now being carried out. The existing wells were: Eccleston Hill, with a present yield of 570,000 gallons per day; Whiston, 544,000 gallons; Collin's Green, 630,000 gallons; Knowsley, 1,000,000 gallons; and Kirkby, 1,500,000 gallons—the Melling well being in course of construction. Having given numerous details regarding the geological formation of the sandstone in which the wells are sunk, Professor Hull remarked that the experience derived from them, as from those of other districts, was that the first supplies from these deep sources, when newly tapped, could not be relied upon for continuance as regarded quantity. When pumping operations first commenced, the yield was larger than proved to be the case after the experience of a few years. The supply at first was at its maximum, because they were drawing on the large quantity of storeage water with which the rock was saturated, and which must remain there until the water was drawn off by artificial means. As regarded the water-bearing capacity of the rock, they could infer that it might be looked upon practically as a huge sponge, permeable in every direction, and waterlogged in its natural state. In all cases, however, there was an underground water-level, which rose towards the interior, and fell seawards. In reference to quality, the water from the Bunter sandstone might be considered as pure and wholesome, and of a permanent temperature of somewhere about 60° Fahr. both in winter and summer. "River Pollution" was the subject of a paper by Mr. W. Spinks, Assoc.M.Inst.C.E., Lecturer on Sanitary Engineering at the Yorkshire College. As one who was born and had lived all his life almost on the banks of the Mersey and its tributaries, he said he had no hesitation in confirming the description of them as "a sort of cross between a sewer and an ashpit." Among the remedies he suggested were the removal of all pieces of rock which obstructed the flow of the channel and the paving of the bed of the streams, so as to form an inverted channel in the dry-weather flow. Sir C. Cameron, commenting on the papers, pointed out that the determination of the qualities of water was still in an unsatisfactory condition, notwithstanding the labours of the Water Commission. One set of men said they did not care about chemical analysis of water; another that they did not care about bacteriological examinations, but what they did care about was pedigree. What did pedigree mean? It meant the origin of the water. Now let them examine the pedigree of one of the most remarkable water supplies in the world—that of Hamburg. Its pedigree was bad; the sewage from 1,800,000 people went into the Elbe, the waters of which were used by the inhabitants of Hamburg and Altona. In the recent terrible outbreak of cholera, there were 17,000 cases and 7000 deaths in Hamburg. That same water was used in Altona without any cases of disease arising. Therefore he came to the conclusion that the enormous mortality caused was due to conditions quite apart from the water supply. In his opinion, it was due to the extremely unhygienic conditions which existed in large portions of the city of Hamburg. Mr. C. Burt held that the effort to exclude objectionable matter from every stream and river in the country would be much better made by county councils or large conservancy boards than by small local bodies. Major L. Flower thought that any such authority should have charge of the whole watershed, and not merely of the strip of main river. Mr. Spinks and Professor Hull having replied, the discussion closed. The other matters dealt with during the day were not of special interest to the readers of the JOURNAL.

On Friday, Dr. T. Stevenson, Scientific Analyst to the Home Office, delivered an address on "The Self-Purification of Water," and on the manner in which, and the natural agencies by which, this process of purification is effected. He said that during the last twelve or fifteen years, the opinions of most of them had undergone a great change; and many who formerly held the view that a river once polluted with sewage was incapable of self-purification, and that even when filtered the water was still not potable, now believed that by sedimentation and filtration such water was effectually purified and freed from all noxious constituents. Having described how this change of opinion had been brought about, and attributing much of it to the researches of bacteriologists, he said that all now accepted the fact that bacteria are among the main agents in the purification of water, as well as inducing infectious diseases such as typhoid and cholera. They were still almost entirely in the dark as to how far and what kinds of pathogenic bacteria were destroyed by the non-pathogenic. It might be that they could not dogmatize that the introduction of the pathogenic bacteria into the human body alone directly induced the mischief; or it might be that the excretory products introduced with them acted as poisons. In considering the degree of safety conferred upon a water polluted with sewage by the natural processes going on in streams, Dr. Stevenson dealt with the results brought about by sedimentation, disintegration, solution, oxygenation, dilution, light, and by the living processes of vegetable and animal organisms contained in the water; and he reviewed a few of these agencies. After dwelling upon the inferences to be drawn and the suggestions to be made, Dr. Stevenson concluded by stating that the notion that organic matter in a water was *per se* to be regarded as injurious and not potable must be laid aside. Organic matter, and especially nitrogenous organic matter, must, however, be regarded with suspicion. The presence of an unusual amount of it ought invariably to call for the rejection of such water as a source of drinking supply; and the results of chemical analysis must in no case be set aside as altogether illusory. The necessity for guarding rivers from all avoidable pollution, and especially excremental pollution, was rather emphasized than diminished. Although practically they had been unable distinctly to connect disease in the Metropolis with the drinking of water from the River Thames, there was no small likelihood of there being an undiscovered action between the two. They must admit that light, air, agitation, precipitation, subsidence, and, above all, filtration could do a great deal in the way of purification; and that, under favourable conditions, these purifying agents could, and often did, render a polluted water safely potable. But there was a danger in trusting too much to these in leading people to neglect the urgent necessity which everywhere existed of protecting water supplies from pollution. Unfortunately, the large sources of mountain supply were rapidly becoming appropriated by towns to which a water of rare purity and great softness was a primary need for its manufactures, not to speak of health requirements. Those who lived in London lacked that public spirit which guided such municipalities as that of Liverpool. There was a tendency to regard the Metropolitan water supplies as in no danger of failing in either quantity or quality. The selfish section of the community still regarded the Thames merely as a means of securing its own pleasure. At no time had there been greater need of precautions being taken to secure the river from human excremental pollution than at the present, when the floating population in summer was so enormous and where the introduction of fresh human excreta all along the river was a matter of almost complete certainty. A cordial vote of thanks was accorded to Dr. Stevenson for his address. Among the papers read on Friday was one by Mr. A. E. Fletcher, the Chief Inspector under the Alkali, &c., Works Regulation Act, on "The Health of the Workmen in Chemical Factories." "Town Smoke," "The Atmosphere of Liverpool," "The Management of Sewage Farms," and "The Purification of Sewage Water," were the titles of other papers. In the evening, Sir J. Crichton-Browne, M.D., LL.D., F.R.S., delivered an instructive address on "The Prevention of Consumption;" and this brought the congress to a close.

On Saturday, excursions were made to places of interest in the neighbourhood of Liverpool.

Yarmouth and the Electric Light.—The Yarmouth Town Council have given notice to the Gas Company that 120 gas-lamps will not be required after Nov. 1, when the electric light will be ready.

THE INSPECTION OF TAR-WORKS UNDER THE ALKALI ACT.

In the JOURNAL last week we published some extracts from the reports of certain of the District Inspectors under the Alkali, &c., Works Regulation Act, bearing upon the above subject. We had, however, to defer a notice of the remarks of Mr. F. Napier Sutton, the Inspector for the south-eastern counties, on the distillation of tar; and these we now reproduce.

The distillation of tar is carried on at seventeen works in this district; and these differ very greatly in manufacturing capacity, condition of plant, and general management. It may be stated that, as a rule, the type and capacity of the stills employed at the different works are similar; that is to say, the majority of the stills employed are of about 10 tons (2200 gallons) capacity, and the mode of setting these, the method of firing, and the means employed for condensing the distillates are much the same in all the works, with one or two special exceptions, which are to be mentioned presently. The smaller works employ one, two, three, or possibly as many as six stills. Of these works there are twelve. The remaining five are of much greater capacity; the largest having as many as 48 stills of 14 tons capacity each. The exceptions to the ordinary form of stills employed are those used in the different works belonging to one of the largest private firms in the London district. The still is a patent of one of the members of the firm in question, and it differs from the ordinary pot still in being of horizontal boiler shape, having a mechanical stirring apparatus running horizontally through it, and in being heated by more than one fire. The capacity of these stills is generally much greater than that of the pot stills, ranging from 5000 to 8000 and even 16,000 gallons. The same firm are now using a continuous method for the distillation of tar. [A detailed description of this apparatus was given last week, p. 604.]

Crude tar as produced at gas-works always contains a certain proportion of ammoniacal water mechanically mixed with it. A large part of this water separates out in the tar-storeage tanks, by reason of its lighter gravity; and it can be pumped or drawn away. The tar actually charged into the tar-stills always contains, however, some water; and during the early stages of the distillation, it is the sulphide of ammonia contained in it that first gives rise to possible nuisance. During the early stage of the distillation, while the tar is becoming completely dehydrated, a considerable volume of permanent gases, containing sulphuretted hydrogen and some portions of very light naphthas (which are not condensed in the worm) are evolved. The gases given off from the worm-end while the first "runnings" or distillate is obtained are very pungent; and the cessation of these strongly-smelling gases is very marked as soon as the light oil begins to run. The gases which are evolved from the worm-end during the remainder of the distillation do not contain much sulphuretted hydrogen until the final stage is reached; but, meanwhile, vapours having a very strong pungent smell are given off, especially during the running of the creosote oils. This is in a great measure due to naphthalene vapours, which have a very characteristic odour; and in bright weather the crystals of naphthalene, or "feather," can be seen floating in the air in the vicinity of the receiver, and sparkling in the sun. During this period of the distillation, the condensing-worm is kept hot to prevent blockage of the worm with naphthalene crystals, and the evolution of vapour is enhanced in consequence. With the cessation of the creosote oil distillate, the final distillation process is reached—viz., the recovery of the anthracene oil. It is now universally the custom—certainly in all well-appointed works—to inject superheated or dry high-pressure steam into the contents of the still at this stage. The maximum temperature of distillation has been reached by this time; and a certain amount of destructive distillation, with separation of carbon and permanent gases, has been produced by excessive local heating of the viscid still contents, so that the gases and vapours which are evolved at this point increase in volume, and frequently have a very rank and acrid smell. The introduction of steam during the final stage has led to a most beneficial reduction in the amount of destructive distillation taking place; but it still occurs to some extent. In those cases in which steam is not employed, but where the stills are fired up to the end of the process, the vapours given off are very dense and irritating, and contain such bodies as pyrene, chrysene, &c. During the distillation of the anthracene oil, the condensing-worm is not kept cold, although cooler than during the running of the creosote oil; and if kept too warm, there is a danger of anthracene and hydrocarbon vapours escaping, which have a dense yellowish-white appearance. In two instances, these vapours were observed to escape in considerable volume, and to travel some distance; and they were the foundation of a complaint by occupiers of neighbouring houses. The escape was due to careless working; and it must have resulted in a decreased yield of the most valuable of the tar products.

It is obvious, from the foregoing remarks, that objectionable permanent gases and strongly-smelling vapours are evolved more or less during the whole period of the distillation of tar. Hitherto, as a rule, these gases and vapours have escaped unchecked. Previous to the enforcement of any regulations by the Act, only three out of the seventeen works were found to employ means for dealing with these gases. Only in the case of the largest of the works were these found to be at all adequate, and even in that instance further improvements have since been made. The adoption of the necessary means for treating the gases was made very slowly and reluctantly in many cases; and great fear of danger from fire and explosion was expressed at the suggestion to deal with these by burning them. But when it was seen to be safely and easily done by others, this fear was removed; and the combustion method has been generally adopted. The only alternative was the absorption of these gases in oxide of iron. Personally, I give preference to the former method, if properly carried out, and for the following reasons: The gases do not consist entirely of sulphuretted hydrogen, although the disagreeable odour is largely due to the presence of that gas; but other noxious-smelling gases are present, such as carbon bisulphide, hydrocarbon vapours, benzene, and pyridene, none of which would be decomposed by oxide of iron, but which are easily and completely destroyed by burning.

Two methods can be employed for separating the gaseous compounds from the liquid distillates at the worm-end. The latter can be trapped by means of a syphon bend, and the gases conducted away by a pipe fixed on the still side of the syphon; or both gases and distillates can be delivered from the open worm-end into the receiving-tank for the distillates, and the gases can be drawn away from thence by mechanical means. The former method is not practicable in all cases, on account of some tars being so highly charged with naphthalene that difficulty is experienced in keeping the worm clear during the distillation of the creosote oils; and to avoid danger of explosion when such a block occurs, it is necessary to clear the worm-end with a rod, which would be impossible where a syphon bend existed. Hence either system is adopted according to individual requirements. Whichever plan is selected, it is necessary to use some means of artificial draught; and that used in the smaller works consists of a steam injector or blower, while in the larger works an exhaust-engine is generally employed. The gases thus exhausted contain condensable vapours—viz., steam and hydrocarbon vapours; and it is necessary to condense these in a suitable manner before passing the permanent gases to the fire or purifier. The means employed differ in individual cases according to the necessity for great or small condensing power; but the principle is similar in all. It will not, perhaps, be necessary to give a detailed description of the plant employed in every case; but an account follows of the appliances set up in a few of the works, typical of those used in others, but differing slightly in detail.

The smallest tar-works in the district has only one still—a 10-ton The proprietor has had a long experience of tar distillation; and he has devised a very simple but effectual means of treating the still gases. The worm-end delivers direct into the receiving-tank, the lid of which, although easily moveable, fits closely. The gases are drawn away from the receiver by means of a small steam ejector, and pass through two perpendicular condensers, similar to a Liebig's condenser, consisting of the 1-inch draught-pipe surrounded by a 9-feet length of 5-inch pipe, used as a water-jacket. The steam ejector is situated between the two condensers, so that the steam used for draughting is condensed in the second. At the base of each is placed a small iron tank, provided with a syphon overflow to catch the condensed liquors. The second of these also acts as a water-seal, to prevent any danger from firing-back. The gases thence pass to the boiler fire; and they can at times be seen to burn steadily. The vacuum obtained in the receiver is excellent; and no escape of gas occurs. The connections are 1-inch throughout. This method has been copied by the proprietors of several other small works, who have adapted the apparatus to the two or three stills used by them.

At another works, where six 10-ton stills are employed, the gases are drawn away from the receiver into a 3-inch main by means of an exhaust-engine. The gases are then forced through a washer consisting of a horizontal boiler partly filled with water; and thence they pass through 70 yards of 2-inch pipe to a large oxide of iron purifier, formerly used for treating the gases from the sulphate of ammonia plant. The method appears to answer well; and at present the oxide shows no signs of exhaustion. It, however, smells strongly of benzene; proving that this vapour is not easily condensed, even after passing through a washer and a very long length of pipe. Absorption of the still gases by oxide of iron has been adopted in one other case; but the draughting means employed are not yet satisfactory.

One of the most extensive and effectual apparatus so far erected is employed at works where nineteen tar-stills (2600 gallons capacity) exist. All the receivers here are connected by 2-inch pipes to a 6-inch main running along the whole range of stills. The connecting-pipe from each receiver is fitted with a Beck valve, which can be closed when that particular still is not in use. The gases pass by the main to a tubular condenser 6 ft. 10 in. high and 5 ft. 3 in. diameter, containing 125 2-inch tubes, water-jacketed. From thence they pass through two coke scrubbers each 32 feet high and 3 feet in diameter, and from these into a horizontal boiler 12 feet long and 3 feet in diameter, used as a washer. A powerful exhaust-engine provides the necessary suction; and after passing this, the gases are blown through a second washer of similar size. At this point, the gases are divided and distributed through these pipes, each passing to a water-seal 1 foot in depth, and thence the gases pass by 1¼-inch pipes to the boiler fires. At this works a considerable quantity of ammoniacal liquor (2 oz. to 3 oz. strength) is recovered from the scrubbers, along with a certain amount of oil, which is collected but has not been examined. Formerly considerable nuisance existed in the vicinity of these works; but since the appliances above described have been in use, the atmosphere near the stills has entirely altered in character, and is so entirely free from the usual odours accompanying tar distillation, that it is difficult to realize that the stills are actually in operation.

In the case of the largest tar-works in the district, the 48 stills employed are mounted in sets of eight. The worm-ends are trapped, and the gases are draughted by a powerful steam exhaust through a main-pipe running along each set. The length of pipes exposed to the cooling action of the air is so great that no special condensers are necessary, and the gases are draughted to the boiler fires after passing through a water-seal. Condensers formerly existed here; but they were found unnecessary, and were removed. All the tar-works, with the exception of two, are provided with means for treating the gases.

Reporting upon Scotland, Mr. W. S. Curphey states that the distillation of tar is the process most numerously represented among those brought under inspection in Scotland by the Act of 1892. There are two forms of air pollution incidental to tar distillation—viz., the escape of noxious gases (chiefly sulphuretted hydrogen) during the course of distillation; and the escape of heavy vapours after the distillation is concluded, and the hot contents of the still are being removed. Three modes of dealing with the noxious gases have been introduced—viz., destruction by fire, absorption in hydrated lime, and absorption in oxide of iron. These Mr. Curphey describes. In six works in Scotland, naphtha and boiled tar alone are prepared from the gas tar. In four works, the operations are of a most limited nature. In all the remaining works, intermediate receivers for the hot pitch are in use; and in three cases the pitch-beds are covered in as an additional preventive.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

This week the Edinburgh and Leith Gas Commissioners took the important step of reducing the price of gas from 3s. 6d. to 3s. 2d. per 1000 cubic feet. The estimate upon which that step was taken proceeded on the assumption that the gas to be manufactured during the year is to be from coal alone, as at present. It is not certain that this will be the case; for the Commissioners, at their meeting on Monday, gave authority to have the installation of the Peebles oil-gas plant, which they agreed to in July last, proceeded with in the Edinburgh works. In the event of the oil-gas plant being brought into use, as it might be, in January, there would be a saving from the working of it of from 4d. to 5d. per 1000 cubic feet of the gas enriched, which would make the position of the Commissioners sure. It will be observed that, in the statement of Mr. Kinloch Anderson, the Convener of the Works Committee (given in another column), he did not take the oil-gas process into account—probably not desiring to "count his chickens before they are hatched." His statement of the advantages which the community enjoy in consequence of the municipalization of the gas supply is a striking testimony to the careful working of the undertaking. The Commissioners have given the community £100,000 in five years, all of which, as Bailie Archibald said, would, under the Companies, have gone into the pockets of the shareholders. The Lord Provost emphasized the need there was for a low price, with the remark that their surest refuge against electric light was cheap gas. He did not believe that they would suffer from competition with electric light, because it would stimulate the users of gas to burn more. He also called attention to the fact that in Edinburgh they were far behind many towns in the use of gas for other purposes than illumination. There was not one cooking-stove in Edinburgh for every three or four in many other places; there was hardly any heating by gas; and gas-engines were few, which was all due to the high price of gas. One of the members asked about the price of gas in Glasgow; and the Lord Provost explained that the low rate there was on account of the small charge for annuities and the lower quality of the gas supplied. Mr. Kinloch Anderson supplemented this with remarks which do not coincide with the opinions that are gaining ground regarding illuminating effect. He said the real test of the quality of gas was the amount of the bills; and he did not believe that in Glasgow gas bills were lower than in Edinburgh, because in Glasgow they required to burn more gas to get the same amount of light. The point is controversial just now; but I have no doubt Mr. Anderson knew what he was speaking about. He is a business man, and must know what the lighting of premises in Glasgow costs as compared with Edinburgh.

It was reported to the Commissioners that the Assessors had valued the undertaking in Edinburgh for the current year at £51,889, as against £38,567 last year; in Leith, at £14,053, as against £10,317; in the annexed district, at £614, as against £452; in the county of Edinburgh, at £1816, as against £1319; and in the Water of Leith Purification district, at £771, as against £567—an increase this year of £17,921. These increased valuations, of course, arise from the larger surplus the Commissioners had on their accounts for the past year.

The Corporation of Falkirk and the Falkirk Joint-Stock Gas Company, though they are under obligation, according to the Act of Parliament obtained last session, to negotiate for the transfer of the Gas Company's undertaking to the Corporation, are very shy in the matter of approaching each other. The Corporation, as the purchasers, seem to have a peculiar backwardness in "popping the question;" and the Company will not "give themselves away" unless approached in a proper manner. A few weeks ago, the Company took the Corporation into Court, with an application to have the latter interdicted from proceeding with the arbitration, because they had not given notice to treat according to the Lands Clauses Acts. On that occasion, the Judge granted interim interdict, and sent the case into the Court of Session to be tried on its merits. That would have meant that the whole of the winter would have been wasted in discussing an abstract legal point; and the transfer would have been unnecessarily delayed. Accordingly, six days later, on the 12th ult., the Corporation served a notice on the Company, which was intended to be a removal of the cause of complaint; and, if it had been effectual, this would have allowed the negotiations for the transfer to proceed. The Gas Company, however, are not satisfied with the terms of the notice; and this week they have returned into Court with a fresh application to stop proceedings. The notice which they have received is to proceed to arbitration to fix the price to be paid for the undertaking. It is so drawn that it is regarded as requiring the Company to name a price, and consequently as necessarily excluding from the referees the notion of compulsory sale. The Company accordingly say that it is no notice at all, and that to regard it as such, and to proceed, would be a violation of the existing interdict. The Corporation have been ordered to lodge answers to the Company's statements. Meanwhile, the arbitration, which was fixed to take place next month, is indefinitely put off. Some of the legal gentlemen are anxious to have it while the vacation lasts, and are bringing pressure to bear on the advisers of the parties to get them to come to agreement on the preliminary points upon which they are differing. If they are successful, the arbitration may go on soon; but if not, it is impossible to even conjecture when it may take place. The difficulties which they find their inability to surmount arise from the desire on the part of the Corporation to drive a "good" bargain, which is nothing more nor less than that they wish to acquire the undertaking for less than it is worth. This is a spirit with which it is impossible to sympathize. If an arbitration is to take place, it should be sufficient to fix the price to be paid; and the price should be the full value of the undertaking. To fix any other price by excluding certain matters from the notice of the referees, would be simply to reduce the proceedings to a farce. If it had been intended that there should be only a restricted reference, this should have been made clear at the time Parliament was considering the measure authorizing the arbitration.

The memory of the public is short. About fourteen years ago, when Sir Thomas Boyd, who was Chairman of the Edinburgh Gas Company at the time of the transfer, was Lord Provost of Edinburgh, the Corporation, in a fit of economy, directed that one-half of the street-lamps should be extinguished at midnight. One member of the Corporation—I think the Lord Provost himself—was horrified at the enormous waste which was involved in the burning of the whole of the lamps all night. Much has happened since then; and particularly there have arisen those questions which are now aired so much at public boards, relating to the payment of standard rates of wages and the hours of employees. The heart of one of the Magistrates of the city of Edinburgh bleeds for the poor lamplighter, whose lot, since he was required to make a midnight tour of his district, has been, in the lamplighter's own estimation, "not a happy one." Accordingly, on his initiation, it has been resolved to set aside the economic resolution of former days. The lamplighters will now go to work with a merry heart; and the Magistrate, in whose ward most of them reside, when he next faces his constituents, will have an effective text on which to claim their suffrages. This, of course, he would be the first to decry as his motive. He is fond of telling the Council that he acts in the public interest; and this is put forward as one of the reasons for the change. In this instance, the public interest will cost the ratepayers £1100 a year for the extra gas consumed; and the public will not be one whit the better for it. What amuses me over the matter is that those who chronicle contemporaneous history—to wit, the newspaper writers—when the resolution to extinguish half of the lamps was agreed to, applauded it; and now, when this is being set aside, they again write approvingly.

A peculiar fracas occurred at a meeting of the Aberdeen Gas Committee on Wednesday. A workman, an old man, some time ago had the misfortune to meet with an accident in the gas-works, which resulted in his losing one of his hands. Now, a one-handed man can be of little use in a gas-works; and accordingly a Sub-Committee, who had considered the circumstances, recommended to the Committee that the man should receive a pension of 7s. 6d. per week. The proposal was, however, distasteful to the Committee, who agreed that "as the man was recovering"—a most strange thing to say of a man who had lost a hand—he should have a six months' trial at his work. Mr. Smith, the Engineer, declined to take the man back; and some forcible language was indulged in. One of the members expressed himself to the effect that "it was hardly for Mr. Smith to refuse to do the Committee's bidding." Eventually, it was agreed that the workman should get a month's holiday; and should receive his full wage of 19s. per week during that time. Now, it is quite true that Mr. Smith is a servant of the Committee; but he is also their adviser, and, more than that, he is responsible for the efficient conducting of the gas business of the Corporation. It is difficult to draw the line where the authority of the Committee ends and that of the Manager begins. Generally speaking, it is at the gate of the works. If a manager has not power to employ whom he pleases, then he is not manager. More than that, a Committee who should interfere with their Manager's discretion as to his employees, would lower his status in the eyes of the employees, and discipline in the works would be gone. Special cases might be excepted; but this was, if the expression is permissible, the very opposite of a special case. It was a proposal that Mr. Smith should take a disabled man into the works—a proceeding which might have led to discontent among the other workmen, because of extra work thrown upon them, and of extra risk which they might run on account of the poor man's inability to take his turn of work. Mr. Smith was therefore justified in resisting the proposal; and he will do well to stick to his position.

The Bervie Gaslight Company have held their annual meeting, and have resolved to continue the price of gas at 8s. 9d. per 1000 cubic feet. It was stated that last year's working showed a small balance in favour of the Company. No wonder it was small, with gas at so high a figure. It would surely pay them better if they made an effort to reduce the price.

The Melrose Gas Company have reduced the price of gas from 6s. 3d. to 5s. 7½d. per 1000 cubic feet. The Company light the streets of the town at their own expense. Melrose is the town selected for the meeting of the North British Association of Gas Managers next summer.

The coal strike has now lasted fourteen weeks. This week a conference of the British Federation was held in Edinburgh, at which it was resolved to continue it until the men obtain Federation terms; and the English delegates undertook to endeavour to get the levies for the support of the Scotchmen increased. They also resolved that, should a majority of the masters agree to give Federation terms with a two years' guarantee, the men employed by those masters might return to work. This was what the leaders did. The men seem to be thoroughly tired of the strike, and have been returning to work. It is admitted to be difficult to get them to turn out on picket duty. Without picketing, it will be impossible to keep the men out; and when it fails, the strike will be near an end. To-day it is reported that there are 20,000 miners at work, which is nearly a third of the whole. I had a short railway run this afternoon; and observed the effect of this working in the large quantity of Scotch coal in railway sidings—an unusual sight, for the past two months at least. There is therefore every indication that this miserable struggle for a living wage is near an end. The alternative proposal of the conference has been to-day negatived by the Fife and Clackmannan coal masters, who have resolved that they will not give Federation terms. The masters are certain to remain firm; and consequently, unless unprecedented levies be raised in England, it is hopeless to expect the men to remain out much longer. Many of them have been waiting to see what the Edinburgh conference would do; and now that its decision is known, it is anticipated a much larger number will return to work.

The Proposed Water-Works Extension at Nelson.—At a special meeting of the Water Committee of the Nelson Town Council last Thursday, it was decided not to proceed with the scheme for the construction of a new reservoir in the Ogden Valley. This decision has caused some comment, particularly as the Committee had previously engaged engineers, and had advertised for tenders for making the reservoir.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Sept.* 29.

Sulphate of Ammonia.—The position remains a curious one. It cannot be said that much sulphate is pressing on the market; and a fair quantity seems to be changing hands. Still prices decline steadily. The reason probably is that superficially the demand appears to remain in abeyance; and no doubt the principal consumers are simply supplying themselves from hand to mouth. The great danger at present is the increasing production, which, if forced on the market while the existing state of things lasts, may ultimately have a serious effect upon values; but nobody can, with any degree of safety, say what will happen within the next few weeks—the chances being pretty evenly balanced. £13 seems to be the top value to-day.

LONDON, *Sept.* 29.

Tar Products.—Benzols are steadier; and makers are more hopeful of seeing higher values. But with the enormously increased, and ever-increasing, production from coke-ovens, it is difficult to see how any permanent improvement can come about. Pitch is firm; but whether the better feeling is due to speculation or to actual demand will be proved as the season advances. Carbolic acid products are moving; but the prices continue low. Other products are dull, with an inclination to lower prices. Anthracene is held at Committee's rates; and tar contracts are being entered into at varying prices, according to position and constitutional value. A great disparity exists in the intrinsic value of tar nowadays. Business has been done during the week at the following rates: Tar, 15s. to 19s. Pitch, 35s. to 37s. 6d. Benzols, 90's, 1s. 2d.; 50's, 1s. 2d. Solvent naphtha, 1s. 3d. Toluol, 1s. 4d. Creosote, liquid, 2d.; ordinary, 1¼d. Salts, 16s. Carbolic acid, 1s. 7d. Cresylic acid, 1s.; crude, 10d. Anthracene, nominal, "A," 1s. 2d.; "B," 10d.

Sulphate of Ammonia is quiet; and the improvement that is daily expected has not yet come. Very little business has been reported during the week; and the price may be taken to be £13 to £13 5s. less 3½ per cent. Gas liquor is quoted at 9s. 6d. to 11s.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—The month opens without any material change in the position of the coal trade, either as regards prices or demand. The better qualities are perhaps moving off rather more freely for house-fire consumption; but any increased demand in this direction, which is still only slight, is being counterbalanced by lessened requirements for export to Scotland. Supplies of all descriptions of round coal continue excessive; whilst very few pits are able to work more than four days a week, a many of them are even on a more restricted output than this. Quoted prices remain much as they were last given; the better qualities being rather steadier, whilst inferior sorts tend, if anything, towards weakness, especially in the commoner descriptions of engine fuel. At the pit mouth, best Wigan Arley averages 11s.; Pemberton four-feet and seconds Arley, 10s.; common house-coals, 8s.; steam and forge coals, 7s. to 7s. 6d.; with slack to be bought at as low as 3s. 6d. to 4s. for inferior sorts, to 4s. 6d. and 5s. for medium qualities, and 5s. 6d. to 6s. per ton for the best descriptions. In the shipping trade, there is still a fairly active business doing; but buying on Scotch account is carried on very cautiously, and prices are not perhaps quite so strong as they were. Ordinary Lancashire steam coal, delivered at the Garston Docks or the High Level, Liverpool, ranges from about 8s. 6d. to 9s. per ton.

Northern Coal Trade.—A full demand has continued for coals in the north-eastern district, owing to the prolongation of the strike in Scotland. Best Northumbrian steam coals have fluctuated between 10s. 6d. and 11s. per ton f.o.b., with collieries at full work; whilst secondary qualities have also been in fair demand at about 1s. below best. Steam smalls have been scarce, as considerable quantities have been sent to Scotland; and the price is now about 5s. per ton. Manufacturing coals are quiet in tone; but the stocks are very small. In regard to gas coals, there is now a better normal demand; and the deliveries are on a larger scale. Prices are still on a basis of from 7s. 3d. to 8s. per ton, though it is believed that some sales have been made at lower prices in proportion. The negotiations for the contract for the Newcastle Gas Company's supply are now proceeding; and some coals are likely to be offered considerably below the current rate in the market. There is no change in the price or position of smithy coal. Coke is, on the whole, steadier; the export demand being relatively better and the home consumption very large, though only moderate quantities are being sent to the north-western furnaces. Generally, best Durham coke may be had at 13s. 6d. to 14s. 6d. per ton f.o.b.; but one or two producers ask as high as 15s.

Scotch Coal Trade.—There is more trade in Scotch coal, consequent upon more men being at work. Prices have, however, stiffened by as much as 2s. per ton, on account of the threatened prolongation of the strike. Household coal is realizing as much as from 13s. to 16s. per ton at the pit, which used to be sold for from 7s. 6d. to 8s. That more men are going to work is shown by the improvement in the shipments. These amounted to 9622 tons—an increase of 1354 tons upon the preceding week, but a decrease of 221,176 tons when compared with the corresponding week of last year. For the year to date, the total shipments have been 3,781,006 tons—a decrease as compared with the corresponding period of last year of 1,596,799 tons, and as compared with the same period of 1892 of 1,762,824 tons. The decrease since the strike began amounts to 1,956,792 tons.

Dastardly Outrage at the Cardiff Corporation New Water-Works.—At a meeting of the Water-Works Committee of the Cardiff Corporation last Friday week, it was reported that an attempt had been made to wreck a workmen's train on the Corporation line running from Cefn to Brecon Reservoir at Cantrel; a branch of a tree having been placed upon the line, by the side of which are several dangerous precipices. There were 150 workmen in the train; but fortunately the engine-driver saw the obstruction and contrived to pull up in time.

Torquay Gas Company.—A meeting of this Company was held on Friday, to consider the payment of an interim dividend for the half year ended June 30 last. Mr. Kitson, who presided, stated that, as compared with the corresponding period of last year, there was a slight decrease in the consumption of gas for private lighting, an increase in the demand for public lighting, and a considerable improvement in the sum realized by the sale of residuals. Coals, too, had cost £400 less than in the corresponding period of last year. The estimated net profit amounted to £4033, of which the half-year's dividend would absorb £3159; leaving the sum of £874 to be carried forward, against a deficiency last year of £34. Since the previous half-yearly meeting, the Directors had completed the purchase of a piece of land, on which they were erecting a large gasholder. They had also obtained an Act of Parliament, under which they had power to raise new capital to the extent of £50,000, and by which the maximum price of gas was limited to 4s. 3d. per 1000 cubic feet. There had been changes in the staff since the last meeting; and Mr. J. B. Duckworth, formerly of Barrow-in-Furness, had been appointed Chief Accountant. In the town Mr. Duckworth came from, 99·55 per cent. of the gas-rentals were collected, after deducting allowances and bad debts. The Directors felt that they had been too lax in the collection of the rentals in the past. They had had too much money out; and the time had come when they must lessen this. A resolution for the payment of an interim dividend at the usual rates of 10 and 7 per cent. having been moved, Mr. W. Grant remarked that ultimately the Torquay Town Council would, no doubt, purchase the works; and he asked if, in such an event, the purchase price would be the nominal capital or the market value of the shares. Remarks which were made outside had, he explained, caused him to feel uneasy. The Chairman replied that something was said about the purchase by the Corporation when the Company's Bill was before Parliament; but the Corporation had a great deal on their hands and nothing came of it. Wherever sales of gas-works had taken place, they had been on equitable terms as regards the market value; and no shareholder need have doubts as to the probability of fair treatment in the matter. The resolution was carried.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 642.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share.	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p.c.	**GAS COMPANIES.**				£ s. d.
590,000	10	12 Apl.	10½	Alliance & Dublin 10 p. c.	10	18½—19½	..	5 7 8
100,000	10	,,	7½	Do. 7 p.c	10	13—14	..	5 7 2
300,000	100	2 July	5	Australian (Sydney) 5 % Deb.	100	105—107	..	4 13 4
100,000	20	14 June	8	Bahia, Limited	20	11—13	..	12 6 2
200,000	5	11 May	6½	Bombay, Limited	5	6½—6¾	—¼	4 16 5
40,000	5	,,	6½	Do. New	4	4¾—5	—¼	5 4 0
380,000	Stck.	15 Aug.	11½	Brentford Consolidated	100	222—227	..	5 1 4
180,000	,,	,,	8½	Do. New	100	174—179	..	4 15 0
220,000	Stck.	28 Sept.	11	Brighton & Hove Original	100	207-212*	+2½	5 3 9
888,500	Stck.	30 Aug.	5	Bristol	100	114—117	..	4 5 6
320,000	20	28 Sept.	11½	British	20	48—49*	..	4 11 5
50,000	10	30 Aug.	11½	Bromley, Ordinary 10 p. c.	10	11½—22½	..	5 2 2
51,510	10	,,	8½	Do. 7 p. c.	10	16½—17½	..	4 17 2
328,750	10	28 June	2	Buenos Ayres (New) Limited	10	7—8	..	1 10 0
200,000	100	2 July	6	Do. 6 p. c. Deb.	100	101—104	+1	5 15 5
150,000	20	12 July	8	Cagliari, Limited	20	25½—26½	..	6 0 8
550,000	Stck.	12 Apl.	13†	Commercial, Old Stock	100	270—275	+3	4 14 6
165,000	,,	,,	10†	Do. New do.	100	200—205	+3	4 17 7
160,762	,,	14 June	4½	Do. 4½ p. c. Deb. do.	100	132—137	..	3 5 1
800,000	Stck.	14 June	13	Continental Union Limited	100	240—245	+1	5 6 1
200,000	,,	,,	10	Do. 7 p. c. Pref.	100	210—215	..	4 13 0
535,000	Stck.	30 Aug.	5	Crystal Palace Ord. 5 p.c. Stk	100	107—112	..	4 9 3
480,000	10	27 July	11	European, Limited	10	22½—23½	..	4 13 7
354,060	10	,,	7½	Do. Partly paid	10	16—17	..	4 17 1
5,646,590	Stck.	15 Aug.	12	Gaslight & Coke, A, Ordinary	100	245—250	+3	4 16 0
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	100—104	..	3 16 11
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	277—282	+2	3 10 10
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	130—135	..	3 14 1
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	200—205	..	3 13 2
1,300,000	,,	,,	7	Do. H, 7 p. c. max	100	180—183	+1	3 15 8
463,000	,,	,,	10	Do. I, 10 p. c. Prf.	100	272—277	..	3 12 3
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	100	165—170	..	3 10 7
1,061,150	,,	14 June	4	Do. 4 p. c. Deb. Stk.	100	127—130	..	3 1 6
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	132—137	..	3 5 8
908,000	,,	,,	6	Do. 6 p. c. do	100	175—180	..	3 6 8
3,800,000	Stck.	11 May	12	Imperial Continental	100	227—232	—1	5 3 5
75,000	5	14 June	6	Malta & Mediterranean, Ltd.	5	5—5½	..	5 9 1
560,000	100	2 Apl.	5	Met. of Melbourne, 5p. c. Deb.	100	111—113	..	4 8 6
541,920	20	14 June	5	Monte Video, Limited	20	15—16	+½	6 5 0
150,000	5	30 May	8	Oriental, Limited	5	7—7½	..	5 5 8
60,000	5	13 Sept.	7	Ottoman, Limited	5	4—4¼	..	7 15 6
166,870	10	31 Jan.	2	Para Limited	10	1¾—2¼	+¼	8 17 9
420,000	100	2 May		People's Gas of Chicago—1st Mtg. Bds.	100	102—107	..	5 12 1
500,000	100	1 June	6	and Do.	100	95—100	..	6 0 0
150,000	10	26 Apl.	6	San Paulo, Limited	10	9¾—9¾	+¼	6 3 2
500,000	Stck.	30 Aug.	15½	South Metropolitan, A Stock	100	328—333	+6	4 12 11
1,350,000	,,	,,	12	Do. B do.	100	277—282	+2	4 5 1
260,000	,,	,,	13	Do. C do.	100	287—292	..	4 9 0
750,000	,,	12 July	5	Do. 5 p. c. Deb. Stk.	100	156—161	..	3 2 2
60,000	Stck.	30 Aug.	11½	Tottenham & Edm'nton, "A"	100	215—220	..	5 4 7
				WATER COMPANIES.				
746,011	Stck.	28 June	10	Chelsea, Ordinary	100	285—290	..	3 9 0
1,719,514	Stck.	12 Apl.	8	East London, Ordinary	100	232—235	..	3 8 1
634,740	,,	28 June	4½	Do. 4½ p. c. Deb. Stk.	100	147—152	..	2 19 2
700,000	50	14 June	8½	Grand Junction	50	120—124	..	3 8 7
708,000	Stck.	15 Aug.	12	Kent	100	302—307	+2	3 18 2
1,043,800	100	28 June	9½	Lambeth, 10 p. c. max.	100	263—268	+1	3 10 10
406,200	100	,,	7½	Do. 7½ p. c. max.	100	207—210	..	3 11 5
330,000	Stck.	28 Sept.	4	Do. 4 p. c. Deb. Stk.	100	132—135*	+2	2 19 3
500,000	100	15 Aug.	12½	New River, New Shares	100	382—387	..	3 2 8
1,000,000	Stck.	27 July	4	Do. 4 p. c. Deb. Stk	100	134—137	..	2 18 4
902,300	Stck.	14 June	6	S'thwk & V'xhall, 10 p. c. max.	100	168—173	..	3 9 4
126,500	100	,,	6	Do. D 7½ p. c. do.	100	150—155	..	3 17 5
1,155,066	Stck.	14 June	10	West Middlesex	100	273—278	..	3 12 0

*Ex div.

† Next dividend will be at this rate.

Sales of Shares.—Messrs. W. G. Stansfield and Co. sold at Bradford last Thursday, 40 "C" shares in the *Gomersal Gas Company* at £5 15s. each.——At a public sale at Boston on Tuesday, £25 shares in the *Boston Water Company* changed hands at £52 each.——Messrs. Beaumont and Glover sold at Wakefield last Friday £25 shares in the *Wakefield Gas Company* at £58 2s. 6d. each, and £5 shares at £11 10s.

Award for the Incandescent Gas-Light.—At the Health Exhibition now being held in Liverpool in connection with the recent congress of the Sanitary Institute, whose proceedings are noticed elsewhere, the Incandescent Gas-Light Company, Limited, is the only lighting firm to whom a medal or diploma has been awarded; and, out of the many firms exhibiting, the Company is one of the four who have received medals.

Yeadon Gas-Retort Company, Limited.—A Company has been formed under the above title, with a capital of £50,000, in £5 shares, "to acquire by purchase, certain patents relating to improvements in retorts or furnaces for the distillation or carbonization of coal or other analagous purposes; to acquire the business of the Yeadon Gas-Retort Syndicate, Limited; to enter into an agreement with the said Syndicate; and to carry on business as mechanical engineers, manufacturers of gas-making appliances, &c."

Warminster Gas Company.—At the recent annual meeting of this Company, it was reported that during the past year the cost of coal had increased by £200; and £133 had been spent in the renewal of retorts, and £157 in permanent works. To meet these extra charges, the Directors, in preference to issuing new capital, had taken £400 from the reserve fund. The profit and loss account showed a balance of £1345, out of which a dividend at the rate of 5 per cent. was recommended. The report was adopted; and a special vote of thanks was passed to Mr. Thomas Hardick on his retirement from the position of Secretary and Manager after 40 years' service.

The Newcastle Gas Company's Coal Contracts.—Tenders are now being invited for the coal supply of the Newcastle and Gateshead Gas Company. The total quantity for the year is a little over 150,000 tons; so that it is the largest gas coal contract for the North. Two years ago, the price paid averaged about 6s. 9d. per ton; but last year, owing to the effects of the strike and the combination of coalowners, something like 7s. 9d. per ton was the price under the contracts that are now running. Recent experience shows that prices are not quite so high now; and it is probable the average rate to be paid will be considerably below that of last year. It is also expected that more coal will be obtained from the collieries outside the combination.

Dewsbury Corporation Electric Lighting Installation.—The Corporation electric lighting works at Dewsbury are nearing completion. They are situated on the site of the old gas-works in the Bradford Road; but the expenditure on them, so far, does not amount to half the sum that the Corporation obtained powers to borrow—viz., £25,000. The building has been erected at a cost of a little more than £3500. Two 100 and one 50 kilo-watt machines have been supplied by Messrs. Crompton and Co.; the dynamos being coupled direct to the engines. A local firm have put in the boilers; and the mains have been laid by Messrs. Siemens Bros. and Co., whose contract amounted to £3856. Mr. W. H. Preece devised the scheme, which is on the low-tension three-wire system. It is intended at the outset to charge consumers at the rate of 6d. per unit.

Windsor Street (Birmingham) Gas-Works Division of the St. John Ambulance Association.—A meeting of this division of the Birmingham Corps of the St. John Ambulance Association was held last Saturday week at the Moseley Botanical Gardens. After tea, Mr. Charles Hunt, M.Inst.C.E., distributed twenty-four certificates to members who had passed the second examination. The members, in giving a vote of thanks to the Medical Lecturer, Dr. D. Holmes, M.D., presented to him a fountain-pen. Votes of thanks to Mr. Hunt for presiding, and to Mr. R. A. Dry, the Drill Instructor, were passed and acknowledged.

British Gaslight Company, Limited.—The half-yearly general meeting of this Company was held last Wednesday, under the presidency of Mr. J. Horsley Palmer. The accounts for the six months ending June 30 last showed a balance of £50,741; and the Directors recommended a dividend at the rate of 10 per cent. per annum, with a bonus of 2s. 6d. per share, both free of income-tax. The Directors reported that the operations of the Company during the above-named period had been satisfactory. Colonel Wilkinson and Major-General Corrie were re-elected Directors, and Mr. E. Yardley an Auditor of the Company; and votes of thanks were accorded to the Chairman and Directors, as well as to the Secretary and officers, for their services in connection with the management of the business.

Unlawful Consumption of Gas.—At the Harlesden Petty Sessions last Thursday, Robert Roach, of 1, Windsor Cottages, Kensal Green, was summoned for unlawfully connecting a service-pipe and consuming the gas of The Gaslight and Coke Company. The gas was cut off on the 30th of August, for non-payment, and the service-pipe capped in the usual way. On the following day, an officer of the Company, when passing the house, saw a light burning; and on communicating with the defendant, the latter admitted removing the cap and connecting the pipes. He now acknowledged that he had used the gas for three days after it had been cut off; but he said he would not have done so had he not been sure of being able to pay the following week. The Bench imposed a fine of 20s., or 14 days, but without costs.

Additional Borrowing Powers for Gas and Water Works at Hereford.—Colonel Luard held an inquiry at Hereford last Friday relating to an application made by the Corporation to the Local Government Board to borrow £3800 for works connected with the water supply and £300 for the provision of gas-mains. The City Surveyor described the existing water-works, and said the necessity for increased pumping power was shown by the following facts: The present engines were erected, the first in 1856, and the second in 1862. They were consequently very nearly worn out, and had recently to be kept running overtime to the extent of two nights per week, and most of the day on Sundays, in addition to the ordinary working period of six days of ten hours each. The proposed new plant would be capable of lifting 2166 gallons of water per minute, or 1,300,000 gallons per day of ten hours. The Water Committee proposed to construct a new engine, engine-house, engine and boiler, and such connections with the suction and rising mains as would enable the whole of the existing engines and machinery to be held in reserve or as a stand-by in case of accidents. The Town Clerk also stated that no disease in the city had ever been attributed to the water supply. The nearest town on the banks of the river was Hay, which was 40 miles off by water, and the next was Builth, 70 miles away.

GWYNNE & BEALE'S
PATENT GAS EXHAUSTERS AND ENGINES.

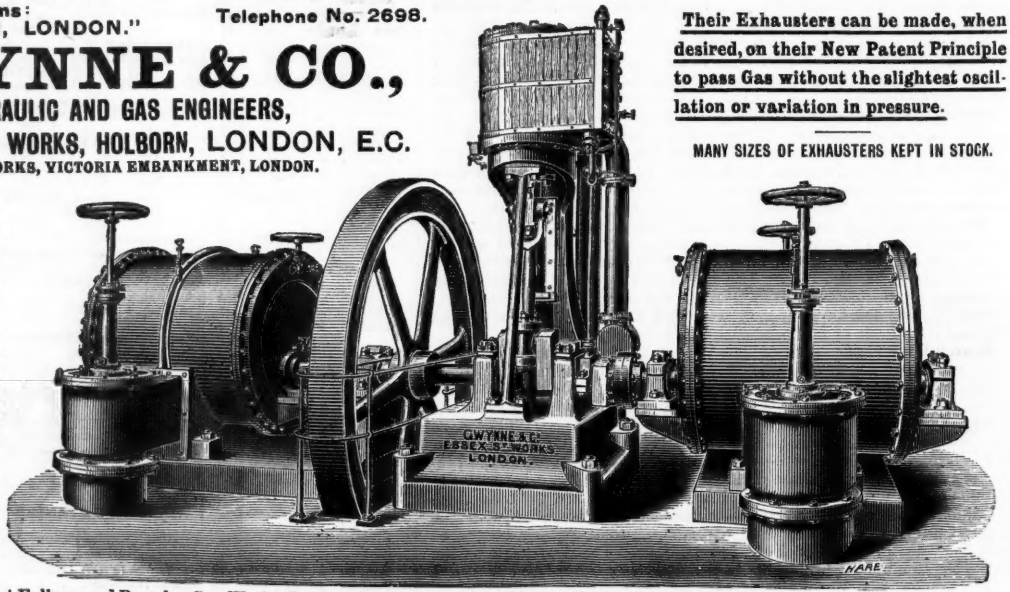
Telegrams: "GWYNNEGRAM, LONDON." Telephone No. 2698.

GWYNNE & CO.,
HYDRAULIC AND GAS ENGINEERS,
BROOKE STREET WORKS, HOLBORN, LONDON, E.C.
Late ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON.

They have completed Exhausters to the extent of 32,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, PATENT RETORT-LIDS, STEAM, PUMPS for Tar, Liquor, or Water; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.



Their Exhausters can be made, when desired, on their New Patent Principle to pass Gas without the slightest oscillation or variation in pressure.

MANY SIZES OF EXHAUSTERS KEPT IN STOCK.

Exhausting Machinery at Fulham and Bromley Gas-Works, London—each set passing 400,000 cub. ft. per hour drawing 14 miles distant from Beckton.
Catalogues and Testimonials sent on application.

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Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

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O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
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JOHN WM. O'NEILL, Managing Director.

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ANDREW STEPHENSON, Agent. All communications *re* OXIDE to be addressed to PALMERSTON BUILDINGS, E.C.

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BROTHERTON AND CO., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

BROTHERTON & CO.
Offices: Commercial Buildings, LEEDS. Correspondence invited.

REDHILL GAS-WORKS ASSESSMENT APPEAL.

THE Report of the proceedings at the hearing of the APPEAL of the REDHILL GAS COMPANY against the RATING OF THEIR PROPERTY in Reigate and Nutfield which was published in the JOURNAL has been reprinted (by desire) in Pamphlet form; and copies can be obtained, on application to the PUBLISHER, *price 4d. each.*

NOTICE OF ACCIDENTS ACT, 1894.

A CARD suitable for Exhibiting in Gas- Works, directing Officers and Workmen to REPORT to the Manager or Deputy-Manager all ACCIDENTS witnessed by them, together with the Clause of the Act specifying the notice required to be sent to the Board of Trade, has been prepared in compliance with a suggestion; and copies can be obtained, on application to the PUBLISHER of the JOURNAL, *price 4d. each, or 2s. 6d. per dozen, post free.*

PYE'S Patent Economizer Screen pro- duces, by Mechanical Screening alone, a Breeze equal to "Best Washed," and at far less cost. Simple, effective, and cannot get out of order. See JOURNAL for Sept. 4, 1894, p. 465; also (for illustrated description) June 6, 1893, p. 1043. Testimonials already received from Consumers and Manufacturers.
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FINEST Quality of Natural Bog Ore.
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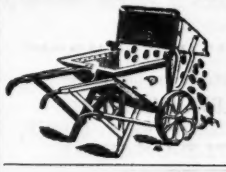

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YIELD OF GAS PER TON . 10,375 CUBIC FEET.
ILLUMINATING POWER . 17·50 SPERM CANDLES.
COKE . . . . . 75 PER CENT.
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A TRIAL IS RESPECTFULLY SOLICITED.

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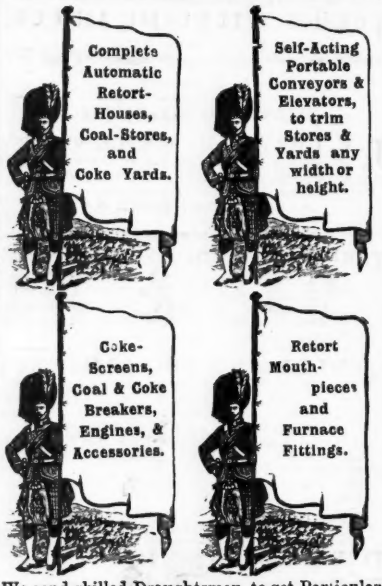
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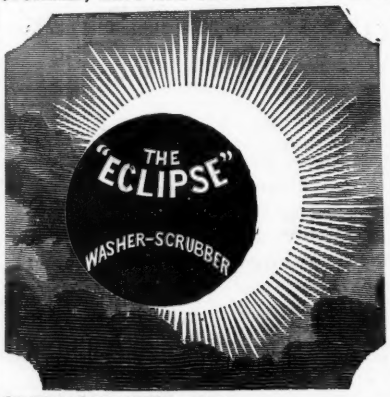
FOR PUMPING AIR, WATER, SEMI-FLUIDS, &c.
See Advertisement in last and next issue.

SEE ADVT., p. 623 OF LAST WEEK'S JOURNAL; ALSO END PAGE OF NEXT ISSUE.



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Yield of Gas per ton . . . . . 10,500 cubic feet.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.
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Highest Results in Gas, & Excellent Coke.
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Rich in Illuminating Power & Yield of Gas.
Above the average in Weight & Quality of Coke.
Maintains a High Standard in Residuals.
THE GRASSMOOR Co., Ld.,
CHESTERFIELD.

LONDONDERRY GAS COALS
FROM THE
MARQUIS OF LONDONDERRY'S COLLIERIES,
COUNTY OF DURHAM.
Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by Mr. John Pattinson, F.C.S., F.I.S.
For Prices and Particulars, apply to
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SEAHAM HARBOUR, COUNTY OF DURHAM.

BOLDON GAS COALS.
Worked by THE HARTON COAL CO., LTD.
Output about 3000 tons per day.

Analysis—		
Yield of Gas per ton .	10,500	Cubic Feet.
Illuminating Power .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to
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HARTON COAL COMPANY,
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MANUFACTURERS OF EVERY DESCRIPTION OF

IRON OR STEEL LAP-WELDED OR BUTT-WELDED TUBES

FOR ANY PURPOSE.

CURLEY CANNEL.

Mr. JOHN METHVEN, Gas Engineer of The Gaslight and Coke Company, Beckton, has tested this famous Cannel, and says:

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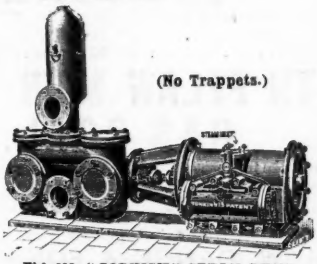

Fig. 600. "CORNISH" STEAM-PUMP FOR WATER. (No Trappets.)

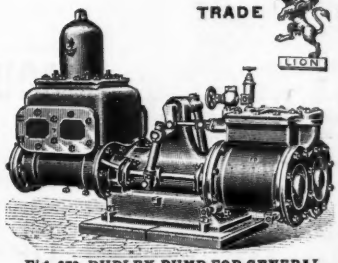

Fig. 670. DUPLEX PUMP FOR GENERAL PURPOSES.

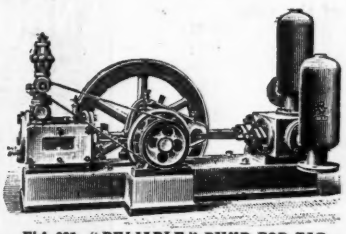

Fig. 683. "RELIABLE" PUMP FOR TAR AND THICK FLUIDS.

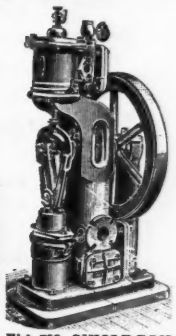

Fig. 703. SINGLE RAM PUMP FOR BOILER FEEDING, &c.

JOSEPH EVANS & SONS, Hydraulic Engineers,

WOLVERHAMPTON. LONDON OFFICE: 16, Union Court, Old Broad Street, E.C.

PHILADELPHIA EXHIBITION, 1876.

ALSO SILVER MEDAL, PARIS.

The Highest Award for Gas-Retorts and other Goods in Fire-Clay has been awarded to KING BROTHERS for their Goods made from their renowned Stourbridge Fire-Clay.

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THORNLEY GAS COALS

WORKED BY THE

WEARDALE IRON AND COAL COMPANY, Ld.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

The Analysis made by Messrs. J. and H. T. Pattinson, Public Analysts for Northumberland, gives 10,500 cubic feet of Gas per ton, with an Illuminating Power of 16·3 Candles and 67·3 per cent. of Coke. The following is a Working Analysis made of these Coals by the Tudhoe and Sunderland Bridge Gas Company:—

[COPY.]

TUDHOE AND SUNDERLAND BRIDGE GAS COMPANY.
Tudhoe Gas-Works,
Spennymoor,
8th June, 1893.

Messrs. The

WEARDALE IRON & COAL COMPANY, LTD.

GENTLEMEN,

For the last two months we have used your **THORNLEY GAS COAL** exclusively at these gas-works; and I have pleasure in herewith giving you the actual results obtained during the trial.

Yield of Gas per ton: 10,300 cubic feet.
Yield of Coke: 13½ cwt.
Illuminating Power of Gas, average of a series of tests, **17 Sperm Candles.**
The Coke was of excellent quality.
The following is a complete ultimate Analysis of the Coal.

	Per Cent.
Carbon	83·128
Hydrogen	5·116
Oxygen	7·401
Nitrogen	0·585
Sulphur	0·620
Ash	3·130
Water	0·020
	100·000

Analysis of the Coke.

Carbon	93·31
Sulphur	0·61
Ash	5·00
Moisture	1·08
	100·00

I am, Gentlemen,
Yours truly,
A. B. COWAN,
Manager.

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WEARDALE IRON & COAL Co., Ld
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STEEL OF ALL DESCRIPTIONS
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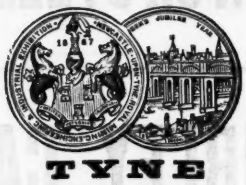

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Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·36 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

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COAL OWNERS, NEWCASTLE-ON-TYNE
OR
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21, JOHN STREET, ADELPHI, LONDON, W.C.

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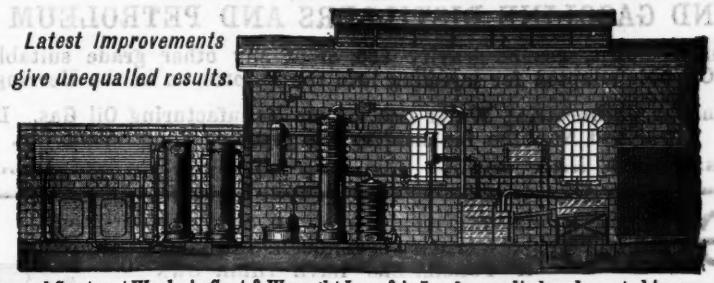

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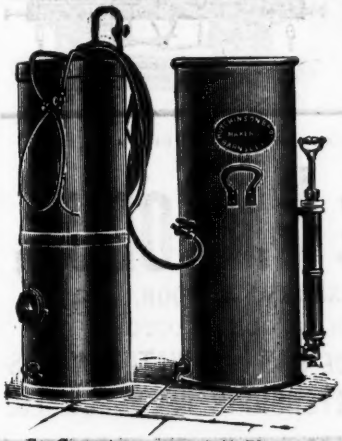

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WHICH HAS NOW BEEN ADAPTED TO

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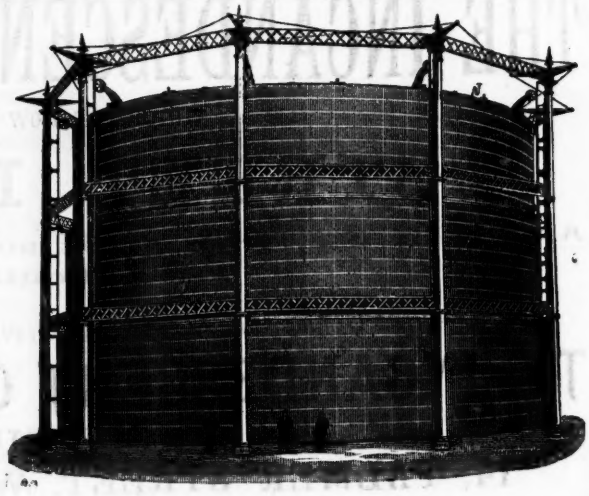

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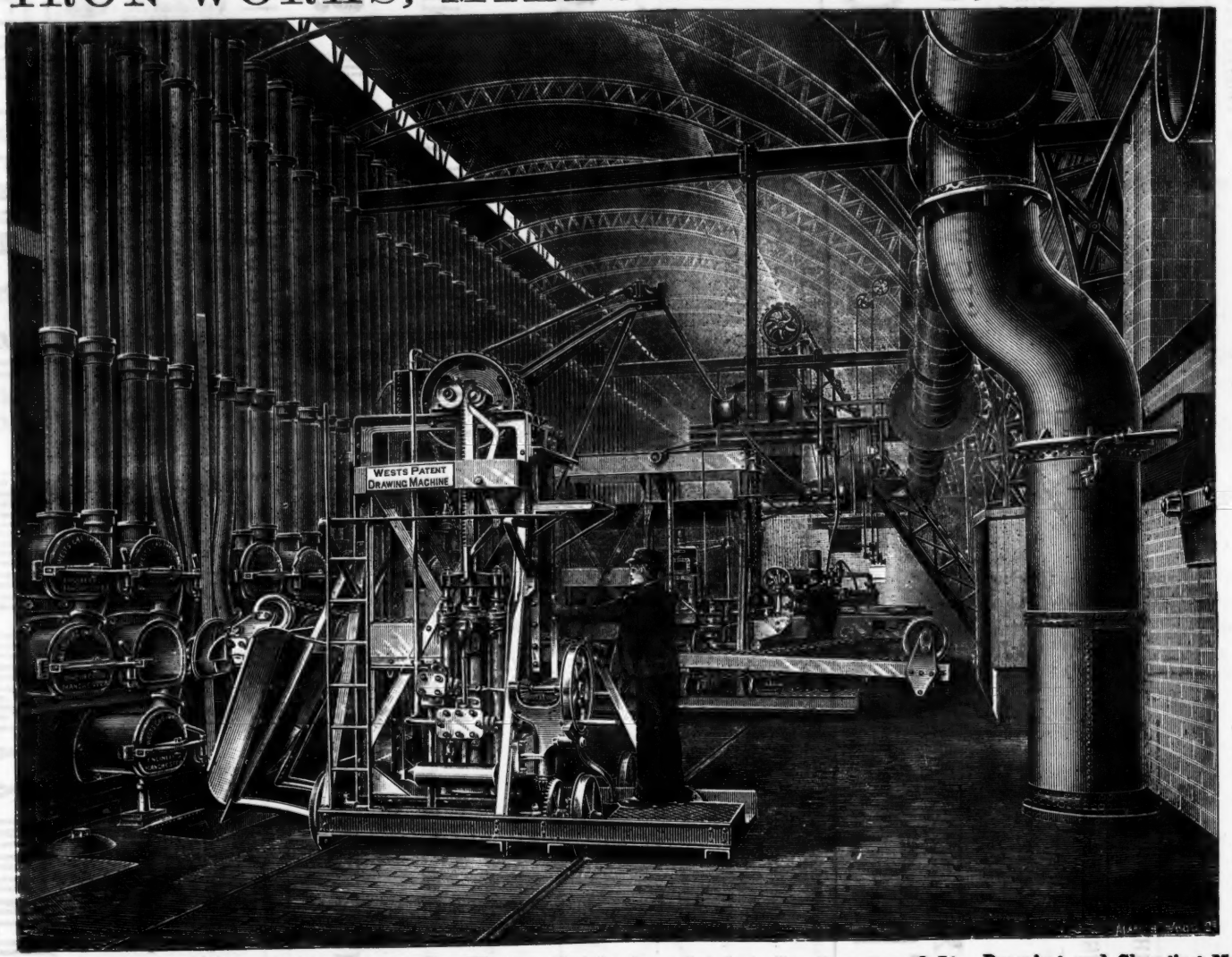

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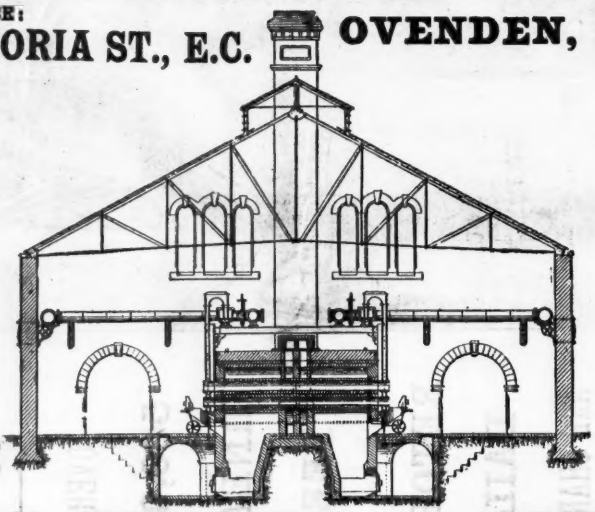

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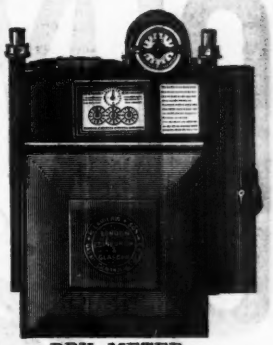

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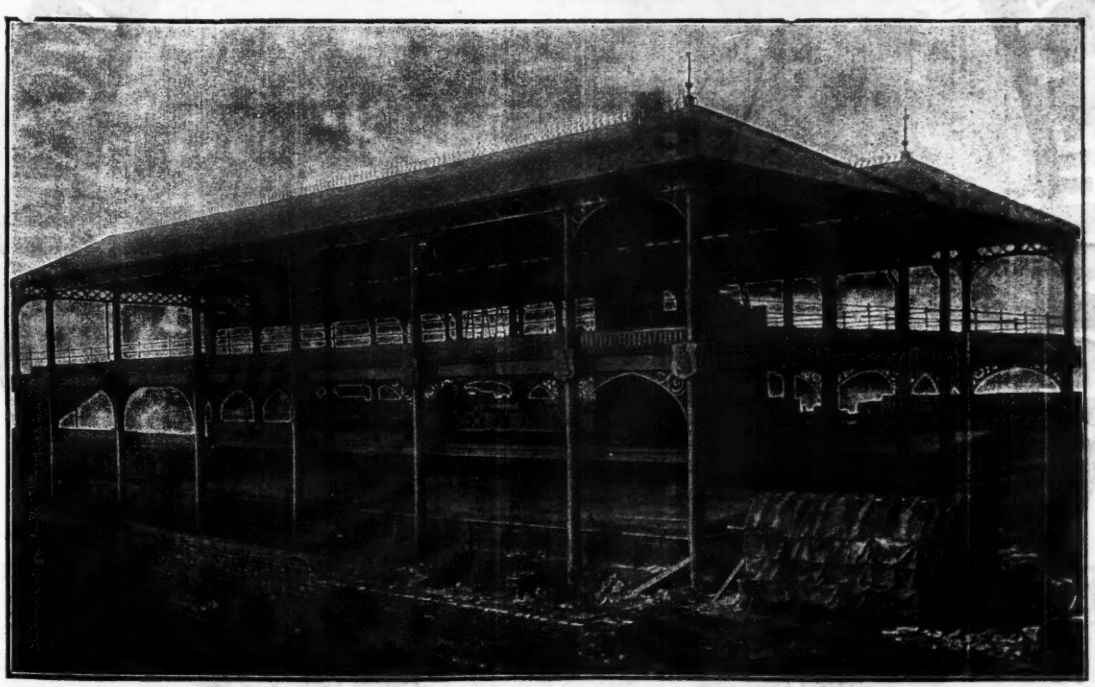

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GASHOLDERS OUR SPECIALITY

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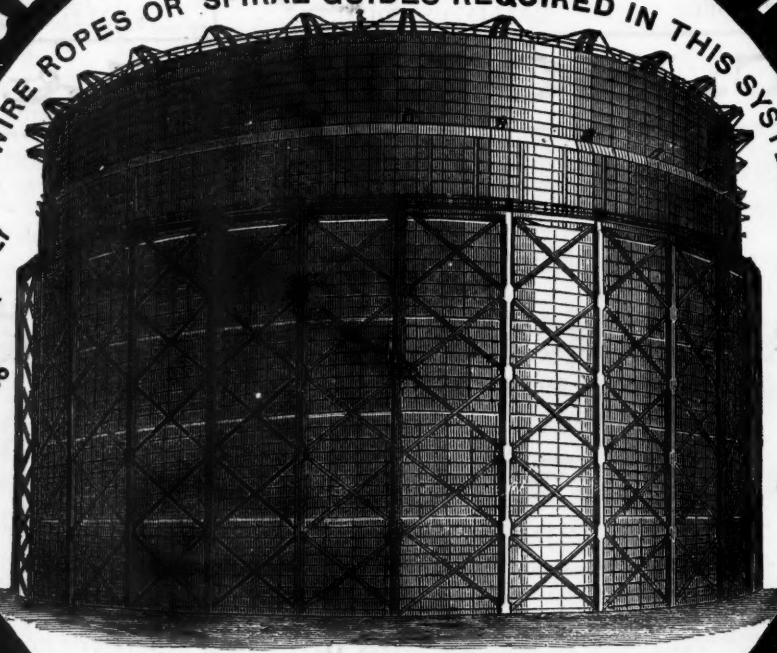

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A 280-CANDLE POWER
PLAIN IRON LAMP,
CLASS A— **55/-**
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PARTICULARS AND PRICES FREE. AGENTS WANTED.

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FOR
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Scoops supplied with or without handles, and of any dimensions or shape required.

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Contractors for the Erection of Gas-Works Complete,
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FIRST-CLASS FINISH.

HIGHEST HEATING POWER.

ELEGANCE and ECONOMY.

THE "PARKINSON" GAS-FIRE.

Massive and Brilliant. 13-inch Fire Front.

A Grand Stove at a Very Moderate Price.

REGISTERED PATTERN.

PARKINSON'S NEW PATTERN GAS-FIRE FUEL

Is made by a Patent Process, and is an improvement on any Fuel of the kind hitherto made. It produces a Fire of intense heat and radiancy, and does not choke the flame.

Send for Parkinson's New Stove Catalogue.

COTTAGE LANE WORKS, CITY ROAD, **LONDON.** Telegraphic Address: "INDEX."

BELL BARN ROAD WORKS, **BIRMINGHAM.** Telegraphic Address: "GAS-METERS."

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